Aalto University
School of Business

The influence of the WTO accession on Russian trade through improved institutional quality

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Marina Zubtsova

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Department of Economics
Aalto University
School of Business

AALTO UNIVERSITY SCHOOL OF ECONOMICS
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Marina Zubtsova

Abstract
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THE INFLUENCE OF THE WTO ACCESSION ON RUSSIAN TRADE THROUGH IMPROVED INSTITUTIONAL QUALITY

The target of this thesis is to study the influence of the WTO on Russian trade through the improved quality of Russian institutions by using a gravity model. It is investigated whether the improvement of the quality of Russian institutions to the EU standards will increase Russian export and import.

The theoretical part of this thesis consists of the theoretical framework of the influence of institutions on trade and the review of the empirical literature on the impact of the WTO on trade and institutions.

In the empirical part the gravity model is estimated for Russian export and import for the years 2000-2011. The influence of institutions on trade is estimated by using the Ordinary Least Squares (OLS), the Instrumental Variable (IV) and the Poisson Pseudo Maximum Likelihood (PPML) methods. The estimation results indicate that Russian institutions have a positive impact on the Russian trade. Russian export has a potential to increase up to 39% and import up to 27% in the PPML estimates if Russian institutions obtained the quality of the European institutions, due to the WTO accession. The institutions of the Russian partners influence negatively Russian trade, unless the endogeneity issues are accounted for. The post-estimation tests revealed that the endogeneity is a serious issue and the IV method gives more reliable results than the OLS method. The PPML method proved to be an appropriate estimator due to the big amount of zero observations in the data.

Keywords: International Trade, Gravity model, Russia, WTO accession, institutional quality, instrumental variable method, PPML

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1 Introduction

The main goal of this thesis is to evaluate the impact of the WTO on trade of Russia through its impact on institutional quality. This chapter is intended to provide background information for this thesis. The first part covers Russia's admission process to the WTO and describes the quality of Russian institutions. In the second part the motivation for the study, the research problem and the applied methods are discussed, followed by the limitations of the study. Finally, the general structure of the thesis is provided.

1.1 Background

In 1985 the economy of USSR was stagnating and there was an urgent need for reforms. The head of the State Mikhail Gorbachev took measures to restructure the economy in order to make it more efficient. Specifically, by the end of his rule in 1993 USSR applied to join GATT. Russia was facing a lot of financial challenges after the collapse of the USSR and several liberalization reforms, such as elimination of the government monopoly on foreign trade, removal of the ban on foreign investment, establishment of convertibility of Russian ruble into foreign currencies. Those challenges were a rather important stimulus for Russia to join the WTO in order to make the economy more competitive.

During the negotiation process with the WTO a lot of pressure was put on Russia to reform fast, as the economic institutions turned out to be weak and inefficient in the new environment after the opening of the Russian economy (Vercuiel, 2007, 12). The main disputes during the negotiations on admission covered financial markets, car industry, imports of agricultural products and intellectual rights.

When Russia became admitted to the WTO in 2012, it was the last major economy whose international trade was not governed by the WTO. The overall economic impact from accession has been less significant for Russia than the benefits from gaining trust from the international partners due to implementing a trustworthy institutional framework (Belton, 2012). After the collapse of the Soviet Union the state did not have the required authority and the laws to protect the rights of ownership or to ensure market rules. As entrepreneurs did not feel support from the state, they asked for private protection from particular state officials. For modern Russia the transition period of the economy has been not smooth due to the imperfect institutions that were inherited from the Soviet period and the rules of behavior of political and economic system. It takes a long time for the Russian market to change the settled methods of doing business that use the weakness of the state for private profit (Levin & Satarov, 2000, 115). The major challenge for Russia in the recent years

has been strengthening the rule of law that involves improving the quality of supporting institutions and eliminating corruption. The problem of making institutions more effective is a political issue because a certain group of officials and businessmen benefit from corruption and a weak rule of law. Despite certain progress in rationalizing the legal institutions during the last 20 years, the most serious barrier to economy modernization are still the political obstacles in improving the rule of law (Frye, 2010, 80).

The "Doing business" ranking of the World Bank (Table 1) can be used to assess the institutions and the rule of law in Russia and compare it to developed countries, BRIC countries and former USSR countries. According to its parameters, the ranking of Russia differs a lot. For example, Trading Across Borders assesses costs (excluding tariffs), time and number of necessary documents to export and import goods by ocean transport. Russia received a low ranking in this index, which means that Russian bureaucracy is not efficient enough to facilitate trade. However, it might be expected that the ranking will improve in the following years as in 2012 Russia made a reform of reducing the number of formal procedures needed for trade (World Bank d, 20.09.2012).

On the other hand, in the Contract Enforcement index Russia is ranked higher than the other BRIC countries, Ukraine and Kazakhstan. The index measures the effectiveness of the judicial system in resolving commercial disputes. It takes into account codes of civil procedure and other court regulations as well as surveys completed by lawyers and judges.

Table 1: Rule of law in Russia

Country	Finland	Germany	France	China	India	Brazil	Ukraine	Russia	Kazakhstan
Trading Across Borders	6	12	24	60	109	121	140	160	176
Contract Enforcement	11	8	6	16	182	118	44	13	27

Source: World Bank, Doing business 2012, www.doingbusiness.org

The amount of corruption in Russia is very significant. Russian INDEM Foundation estimated in 2008 that Russian officials receive yearly bribes of $318 billion. The level of corruption in Russia is comparable to such countries as Belarus, Nigeria, and Uganda (Transparency International, 21.10.2012). Corruption in Russia increases unfair and unlawful redistribution of resources in favor of limited groups, worsening the situation of the rest of the population. Because of the major negative impact of corruption on Russian economy, the government is taking measures to eliminate it. One example of this is the introduction of the National Anticorruption Strategy in 2010 with its main goal to establish legislative and institutional frameworks for countering corruption (National Anti-Corruption Strategy, 17.09.2012).

Summing up, after the collapse of the Soviet Union, Russia was left with inefficient institutions and a corrupted economy that was not able to ensure the rule of law. Despite the efforts of the Russian Government to improve the situation, major problems in economy and inefficient institutions are still present. It can be concluded that an external force as the WTO is needed in order to facilitate the improvement of institutions as well as to make Russian Government commit to the institutional reform. It is important to state that the benefits from the WTO membership can only be explored if Russia will be active and willing to implement the reforms on institutional improvement. According to Hanson & Cameron (2012), the rule of law and democracy will not be improved right away due to the accession, but the practice implementing an international rules-based trading system should have a gradual effect on the legal system.

1.2 **Research problem, method and main results.**

Russia is a transition economy and faces a lot of challenges in transferring to the market economy. The quality of its institutions and the general situation in the Russian economy is far from that of developed countries and a lot of improvements need to be done. In this case recent accession of Russia to the WTO provides a unique opportunity to benefit from the requirements of economic improvements that the WTO imposes on its members. It is expected that the WTO accession will improve the quality of institutions in Russia as well as be the reason for the increase in its volume of trade. Better institutions should improve the commercial code defining contracts, introduce more efficient sanctions of foreign arbitration of contract disputes and enforce the protection of property rights (Babecká Kucharčuková & Maurel, 2004, 691).

The main research problem of this thesis is to answer the question whether the trade in Russia will be increased after the WTO accession due to the improved institutional quality. The target of the study is important as due to the recent accession of Russia to the WTO it is essential to know how Russian economy and trade will change because of that. There are several reasons why the change in the trade flows is assessed through the improvement of institutional quality. First, as Russia has just recently joined the WTO, it is difficult to make any concrete predictions for the future change of Russia's trade volumes, and introducing the change of institutional quality enables to create an empirical model of the improvement of the Russian economy after the accession, and thus, assess how it will influence the trade flows. Second, the views of researchers whether the WTO has any impact on the country's trade flows diverse and one of the suggested reasons why this happens is that country's home institutions play an major role in the effect that WTO will have on the country's trade volumes.

There is a scarcity of empirical studies measuring how institutions are important for trade. Particularly for Russia there is only few studies that assess the influence of the WTO on the trade flows, that is why this thesis is a contribution to the research done in that field. Furthermore, this paper investigates the impact of the WTO on the trade through institutions in two steps: first, the influence of the WTO on institutions is discussed. Second, the influence of institutions on trade is assessed.

The model that is used in the empirical part is the gravity model, which is used to explain the variation in the country pairs' trade flows. Differently from other research done for Russian trade, both gravity equations for exports and for imports are estimated in order to distinguish the influence of institutions on export and import separately. The choice of the gravity setting is explained by its wide usage and proved empirical success. I use three econometric methods: the traditional OLS method, IV (Instrumental Variable) method, to deal with the endogeneity, and the PPML method to account for zero trade. The novelty of the research is that it properly tackles the issue of zero trade flows problem, which is specifically pointed out in the most recent studies as an important factor to consider in order to obtain unbiased estimations. Most studies of Russia's accession to the WTO do not tackle this issue properly.

The estimation results of this thesis indicate that Russian institutions influence positively Russian trade. In case the WTO accession encouraged Russian institutions to obtain the level of quality of the EU institutions, export would increase up to 39% and import up to 27% in the PPML estimates. The institutions of the Russian partners have a negative influence on Russian trade, unless the endogeneity issues are taken into account. The PPML method proved to be appropriate due to the big amount of zero observations in the data.

1.3 **Limitations of the study**

There are some limitations in the study. This thesis does not have a multilateral setup and focuses only on Russia's pairwise trade with other countries. This is usually done in order to model more precisely the country-specific parameters. For the case of this thesis, it enables to distinguish the influence of Russian institutions from the influence of the Russian Partners' institutions. Gravity equation specification makes it possible to include different country characteristics that influence its trade (i. e. membership in trade unions, FDI). This thesis focuses solely on the quality of institutions, therefore limiting the number of included independent variables. The reason for this is that the main question of the thesis is if institutions have an influence on trade. Hence, there is first a discussion about existing empirical evidence, why Russian institutions should improve due to the WTO, followed by an then estimation of the gravity equation with included institutional variables to

see by how much the improvement of the quality of the institutions will increase trade (in case there is a positive dependence of trade on institutional quality).

Panel estimations are not performed in this thesis for several reasons. Firstly, institutional variables used in this thesis vary little over time. As it will be discussed in Chapter 6.2 it is not recommended to use fixed effects estimation when some of the variables vary little over time. As the PPML model proved to be specified correctly (based on the RESET test, Chapter 7.3.2) and there is a threat of having problems with fixed effects, fixed or random effects estimation methods were not introduced in this thesis. Another reason for not using panel estimations is that there is no command written for estimating fixed and random effects in the PPML set up.

1.4 **Structure of the study**

The research will be done in several steps. In the first chapter, the research problem, motivation for the study and study methods are described. In the second chapter the overall impact of WTO on world trade is introduced followed by a discussion about the influence of WTO on institutions in the third chapter. In Chapter 4 the dependence of trade on the quality of institutions is analyzed both by theoretical model as well as by empirical evidence. Afterwards (Chapter 5), the gravity model framework that is used in the empirical part is explained in detail. As well, the used empirical methods are gone through. Chapter 6 concentrates on describing the data and variables included in the gravity equation. The results of the empirical part are presented in Chapter 7. First, the general results, obtained from estimating the gravity equation are discussed. Second, the influence of institutions on trade is analyzed. Chapter 7 ends by presenting additional post estimation tests, used to check for the quality of the obtained results. Finally, the study is concluded in the last chapter and possible ideas for the future research are presented.

2 Influence of WTO on world trade

The GATT/WTO is one of the most successful examples of an international institution attempting to supervise and liberalize international trade. WTO officially commenced on January 1, 1995, replacing under the Marrakech Agreement the General Agreement on Tariffs and Trade (GATT), which commenced in 1948. Since the founding of GATT/WTO the number of member countries has expanded to a high extent since its founding, and international trade has grown in tandem (Goldstein et al. 2007, 38).

There are various ways of looking at the World Trade Organization. Firstly, it was built with the aim of trade opening, where governments could negotiate trade agreements. Secondly, it is entitled to be a forum to settle trade disputes. Thirdly, the WTO operates a system of trade rules. Fundamentally, the WTO was created to help member governments to try to sort out the trade problems they face with each other (WTO a, 15.09.2012).

There are certain opinions in the literature about the influence of the WTO on trade flows. Rose (2004) was the first one to provide empirical assessment of the influence of the WTO on trade. Rose obtained striking results that despite all the talks of the world leaders about the positive influence of the WTO on trade, there was no empirical evidence that the WTO actually increased trade flows. This statement put to risk the existence of the WTO, as one of the main reasons why it was created was to increase trade flows between countries and to improve trade conditions. The study by Rose (2004) caused big discussions among economists. Some of them agreed with Rose and found new evidence that the WTO did not influence bilateral trade increase. Others claimed that the study by Rose obtained negative results because certain important factors were not taken into consideration. By improving the analysis procedure, those economists managed to prove that the trade increased significantly due to the WTO. The views both for and against this statement are covered below.

2.1 Empirical results against the impact of the WTO on trade

This part covers the empirical results that did not obtain evidence of the influence of the WTO on trade. Table 2 describes empirical methods used by the authors of the papers and their main findings.

Table 2: Empirical results against the impact of the WTO on trade

Author	Empirical methods	Main findings
Rose (2004)	OLS, GLS, fixed effects	Countries joining or belonging to the GATT/WTO do not have different from outsiders trade patterns.
Rose (2005)	OLS, GLS, fixed effects	Effect of the WTO membership on trade for the WTO

		members is insignificant, but when a country joins the WTO there is a trade-creating effect.
Eicher & Henn (2011)	Control for multilateral resistance, unobserved bilateral heterogeneity, and individual preferential trade agreements	The WTO affects trade flows insignificantly, while Preferentail trade agreements (PTAs) produce strong but uneven trade effects. Omitted variable bias is very important for right estimations.
Roy (2011)	Inclusion of zero trade, control for multilateral resistance, proper membership definition	Formal membership in the WTO is never found to increase bilateral trade.

Source : created by the author

By using the gravity equation Rose (2004) measured the effect on trade when both countries were the members of the GATT/WTO and in case one country was a member and the other was not. By using the ordinary least squares method (OLS), random effects (GLS) and fixed effects estimators, he showed that there was no evidence of increased trade flows between formal members of the GATT/WTO. Rose believed that the reasons for not observing an effect of the WTO membership on trade were the following: first, most-favored-nation status was extended to outsiders even without obligation to do so; second, developing countries were not forced enough by the WTO membership to improve trade policies. He suggested that the observed trade increase in some countries was not influenced by the WTO but was due to various other possible reasons like higher rates of productivity, reduced transport costs, converging tastes, the economy shifting to services, growing international liquidity (Rose, 2004, 112). There was a certain critique of the analysis done by Rose (2004). Most importantly, in his study only formal memberships in the GATT/WTO were included, while other forms of participation were completely neglected (Goldstein et al. 2007, 52).

A year later Rose (2005) repeated his research in order to understand how several international organizations influenced trade. He used various methods such as OLS, fixed effects and random effects. He employed fixed effects estimator in order to maintain economical and statistical significance and claimed that the effect of membership on trade for the WTO members was insignificant. Although, by using the fixed effect estimator he showed that when a country joined the WTO there was a trade-creating effect. But, this effect was not observed in the long run when the country already belonged to the organization.

Another study done by Roy (2011) also showed that formal membership in the WTO did not influence trade. In the study both the issue of the zero trade and the need to control for the multilateral resistance terms were taken into account in order to obtain accurate results.

The author believes that the study by Eicher & Henn (2011) is the best example of the research on the WTO that has a result of unchanged trade effects, as in their study they unified the approaches by Rose (2004), Subramanian & Wei (2007), Tomz et al. (2007) and claimed that to show no effect of the WTO on trade it was enough to control for multilateral resistance. Multilateral resistance

occurs when exports depend not only on bilateral trade costs, but as well on bilateral trade costs relative to a measure of both countries' trade costs to all other countries (Rudolph, 2010). Eicher & Henn (2011) believe that until now the opinions of economists diverged due to the omitted variable bias such as multilateral resistance, unobserved bilateral heterogeneity, and individual preferential trade agreements (PTA) trade effects. That is why their empirical methodology accounted for the following biases: multilateral resistance, by introducing time-varying importer dummies; unobserved bilateral heterogeneity, by adding country-pair fixed effects to the dataset; and effects across PTAs, by introducing PTA indicator dummies. The omission of country-pair fixed effects leads to the estimates to be biased upwards (Baldwin & Taglioni, 2006). Eicher & Henn (2011) concluded that the influence of PTAs affected strongly the results of the research on the WTO because when these individual PTAs were not taken into account in the empirical approach, the WTO coefficient may have been biased upward, as the WTO and PTA memberships overlap. This may be the reason why positive results on the dependence of trade flows to the WTO were obtained in some studies. But, once extending the gravity model to recognize the difference between the WTO and PTA, they obtained the result that PTA, created trade strongly, but unevenly across individual agreements.

2.2 **Empirical results in favor of the impact of the WTO on trade**

In this part the empirical results that provided evidence of the influence of the WTO on trade are discussed. The summary of the important findings and the empirical methods used by the authors of the papers is presented in Table 3.

Table 3: Empirical results in favor of the impact of the WTO on trade

Author	**Empirical methods**	**Main findings**
Goldstein et al. (2007)	OLS, fixed and random effects	All members benefited from the GATT/WTO, including developing nations.
Subramanian & Wei (2007)	Control for multirateral resistance, time-varying importer and exporter fixed effects	The WTO had a positive impact on industrial country imports, hence, developing countries exports also increased.
Liu (2009)	Control for zero trade and Heteroskedasticity	The WTO increases trade between existing trading partners and new trading relationships are created.
Chang & Lee (2011)	Nonparametric methods (a pair-matching estimator, sensitivity analysis based on signed-rank tests), control for time-varying multilateral resistance terms	Large GATT/WTO trade-promoting effects that are robust to various restricted matching criteria of the trading countries.

Source : created by the author

Goldstein et al. (2007) showed in their study that all members benefited from the GATT/WTO, including developing nations. They used OLS method to estimate the gravity equation, taking into account fixed effects and time-varying effects. As well, they introduced a measure of participation,

which included all nations following the GATT/WTO rules and having privileges, taking into account formal members as well as nonmembers. By the use of nonpolitical variables, such as proximity and national income, it was shown that the overall effect of participating in the GATT/ WTO resulted in an increase of trade about 43 % among WTO members, relative to pairs of non-participants. Moreover, there was a trade increase for both formal members and non-member participants due to the GATT/WTO (Goldstein et al. 2007, 55). This can be explained by the fact that GATT/WTO created rights and obligations both for its members and non-members, including colonies and newly independent states. Another issue covered in the study by Goldstein et al. (2007) was whether the benefits of the WTO participation stay or trade increases only during liberalization in the early years. To answer this question they compared trade after each negotiating round and found that when both countries participated in the agreement, the increase in trade varied from a significant 136 % after the first round to 24 % after the Tokyo Round (Goldstein et al. 2007, 56). The WTO effect on trade was largest in the early years when only a small number of countries participated and outsiders retained high barriers to trade.

According to the paper by Subramanian & Wei (2007), the GATT/WTO was the reason why the world import increased 120%, as estimated for year 2000. In their study they emphasized general equilibrium trade effects by controlling for multilateral resistance (using time-varying importer and exporter fixed effects). They argued that there existed asymmetries that influenced the patterns of bilateral trade flows and made the promoting role of the GATT/WTO more uneven. In the paper it is stated that developing countries also benefited from the WTO membership. Their exports also increased significantly caused by the positive impact of the WTO on industrial country imports. Due to the GATT/WTO, developing country exports to industrial countries were at least one and a half times greater (Subramanian & Wei, 2007, 174). This means that even if developing countries did not achieve a sufficient level of liberalization, they indirectly benefited from industrial country liberalization.

Liu (2009) suggested that the GATT/WTO not only increases trade between existing trading partners, but also it was the reason why new trading relationships were created. In his study two GATT/WTO members traded 60% more compared to the situation when neither country was a GATT/WTO member and 23% more when only one country was the WTO member. This means that nearly one-third of total world trade during 1948–2003 was due to the GATT/WTO (Liu, 2009, 431). Liu (2009) criticized previous studies where only positive trade observations were taken into account in the traditional log-linear gravity regressions. This lead to eliminating zero trade observations, thus, losing information on new trading relationships. Those relationships arise when

two countries did not trade initially, but started to trade after one of them obtained membership in the GATT/WTO. In order to obtain more precise estimations Liu (2009, 22) suggested using Poisson quasimaximum likelihood estimation to uncover the role of the GATT/WTO. As log-linear gravity regression only provides first order approximation, the higher-order approximations are left in the residuals and heteroskedasticity occurs. In contrast, Poisson estimation is consistent in the presence of heteroskedasticity and can be used in the case when the dependent variable has zero values (Silvia & Tenreyro, 2006, 645).

Chang & Lee (2011) followed the study by Liu (2009) and used only cases when two countries started bilateral trade before either one of them joined the GATT/WTO. By doing so, Chang & Lee (2011) eliminated the membership effect on prompting new trading relationships. In this case it was possible to observe distinctly the membership effect on the trade volumes. Their analysis was based on the dataset used by Rose (2004) and, as a robustness check, the dataset provided by Tomz et al. (2007). Chang & Lee (2011) argued that parametric estimation of gravity-based trade models may lead to misspecifications, diverse membership effects, and unobserved selection bias. In order to eliminate those, they used non-parametric methods such as a pair-matching estimator to estimate the strength of the influence to unobserved variables[1]. The study showed that trade increased significantly for bilateral partners that had both chosen to be members of the WTO. The result of the WTO membership was larger than bilateral trade preference arrangements.

To sum up, the results obtained in the WTO empirical literature strongly diverse. From this the author concludes that econometric specifications have a high impact on the WTO trade effects. Both for economists and policy makers it is crucial to understand the reason for such a diversity of results. Understanding when gains from the WTO can be expected and in what circumstances is essential for policymakers before taking a decision of entering the WTO (Eicher & Henn, 2011). As argued by Basu (2008, 5) the studies obtained different results on the influence of the WTO on trade because trade-specific effects were measured only of acceding countries via membership and the influence of the WTO on the domestic economic policies and institution-building was neglected. Basu's conclusions are supported by the following two papers. First, Li & Wu (2004, 139) made an assessment of the countries where proper working institutions already existed before joining the WTO. They divided countries by income (high and low income countries) and stated that high income economies that had initially proper economic institutions benefited from joining the

1 See: Chang P., Lee M. (2011) The WTO trade effect. Journal of International Economics. Vol. 85, Issue 1, Pp. 53–71

GATT/WTO more than the countries with poor institutions. Second, Allee & Scaleraand (2012) discussed how the requirements of the WTO to improve institutions affected trade. They concluded that when there were stronger requirements to change policies before joining the WTO, the more the country benefited from the membership and experienced higher trade volumes after joining.

As a country's home institutions play an important role in the effect that the WTO will have on trade, in the next two chapters this thesis will focus on the influence of the WTO on a country's trade through institutions. The investigation of this influence will be made in two steps: first, evidence of the impact of the WTO on home institutions will be provided, and second the influence of home institutions on the country´s trade will be discussed.

3 Impact of the WTO accession on home institutions

According to the WTO Secretariat, proper institutions in a country promote open trade. There exist additional damages resulted from trade barriers because they provide opportunities for corruption and other forms of poor governance. The WTO rules require transparency in the trade regulation, thus help to minimize the opportunity for corruption and build better institutions (WTO b, 15.09.2012). This chapter discusses the impact of the WTO on the institutions of the country. First, general evidence and empirical results on this subject are presented. Next, as this thesis focuses on Russia, discuss Russia´s accession process is discussed in order to provide arguments that the WTO membership will influence the quality of the Russian institutions.

3.1 Influence of the WTO on institutions and governance

The WTO has an important role of providing help for newly admitted countries to successfully integrate in the international trading system. Trade policy reform required by the WTO contributes to the economic development as it helps to build high quality institutions (Rodrik, 2000, 2). Before obtaining membership in the WTO, there is a long negotiating process that may last for decades. Countries have to agree on a number of commitments to redesign their domestic economic structure and institutional framework, and to make economic conditions more stable and predictable.

Any country that wants to take the most from membership in the WTO should use it as a tool to support the implementation of policies supporting export-oriented production and activities in which the country has a comparative advantage. As the WTO rules focus on providing market access to foreign companies, greater competition is created in the country, which is generally beneficial to an economy. But at the same time policies and mechanisms should be present in the country to support the functioning of the market. When establishing the standards and institutions required by the WTO, countries can increase the value added of the WTO membership by creating independent institutions aimed at enhancing transparency of trade policy decision-making, which is encouraged by the WTO, but it is not a strict requirement (WTO c, 15.09.2012).

There is empirical evidence that after the WTO accession the institutions of the countries improved. As argued by Basu (2008, 20) the process of obtaining membership in the WTO for 21 recently accessed countries lead to better domestic institutions. By using the Feasible Generalized Least Squares method to capture the influence of the WTO on the institutions, Basu (2008) found that new WTO members benefited from the negotiation process, during which the WTO was an ‘external’ policy anchor helping to introduce changes in domestic institutions.

In contrast to Basu (2008), who used several metrics to measure the quality of institutions (e. g. Heritage Foundation Index), Aaronson & Abouharb (2011) took another approach and studied whether the WTO had an impact on the behavior of the governments on establishing better policies. During and after the accession process, future members follow formal WTO requirements on institutional improvement as well as the members of the WTO can influence the actions of potential members. The results of the empirical research made by Aaronson & Abouharb (2011, 27) correspond to the results obtained by Basu (2008), as for 23 new member admitted in the period 1995-2007 negotiations during the accession process to the WTO lead to improved institutions and better governance. They found as well that the positive effect of WTO on institutions lasted not only for the period of negotiations but as well after the country was accepted, which can be explained by the influence of the country members on each other. It is important to mention that Aaronson & Abouharb (2011) introduced Three Stage Least Squares estimation in order to capture the influence of the WTO on institution.

Due to the fact that this thesis focuses on Russia, it is reasonable to provide evidence for countries with a comparable to Russian economic situation. Research done for the transition countries can be a good benchmark, as Russia also belongs to the group of transition countries. Drabek & Bacchetta (2004) found that the WTO membership not only provided better market access to the transition countries, but also resulted in better institutions in those countries. For transition countries the WTO membership implied less corruption and improved governance without major government revenue loss.

China is a good example of a transition economy that, as well as Russia, has taken measures to move from a centralized economy towards market economy. China´s accretion process to the WTO in 2001 was one of the most followed among the transition countries. Chow (2001, 13) described historical trends of the forces toward the development of democratic political institutions in China, and expected a positive impact of the WTO on those trends. Lopez (2005) assessed the situation in China after five years it had been a member of the WTO. In the paper he argued that the Accession commitments (Transitional review mechanism and Dispute settlement mechanism) introduced strict discipline to China's non-market trade practices. The approach of slow institutional transformation was successful for China as after five years the private sector was growing, domestic prices were almost completely liberalized and needed institutional changes were made to support market economy.

Former Soviet Union countries are a special group of transition countries as their institutional and policy environments, which emerged from central planning, are considerably different from the rest

of the group. This leads to certain differences in the opportunities and challenges associated with the WTO membership. Under central planning only state enterprises and institutions governing international trade existed. The requirements of the WTO to bring the institutions to international standards involved profound changes in the laws for the operation of the markets free from central government control (Michalopoulos, 1999, 2).

In conclusion, accession to the WTO is not an answer to all problems with the country's institutions and governance in general. The WTO measures are not enough to eliminate regulatory barriers that prevent domestic companies to exploit the opportunities of specialization resulting from integration into the world economy (Hoekman & Roy, 2000, 26). Although accession and membership in the WTO plays a big role in the path of trade liberalization and building better institutions, a lot depends on the policies that are pursued independently by the governments.

3.2 **Russia´s accession process to the WTO as evidence of impact of the WTO on institutions**

The WTO accession process can be a useful tool for introducing institutional changes in the country. The process has an impact on a wide range of policies and institutions, such as tariff policy, customs, rights of foreign investors, standards and intellectual property rights (Tarr & Volochkova, 2010, 202). Accession process starts with an establishment of a multilateral working party, where the WTO members investigate whether the candidate´s trade regime is consistent with the WTO rules. Two of the main areas of attention are: economic policies connected with imports and exports and the institutional framework that enforces such policies (Basu, 2008, 10). Acceding members commit to altering their laws, regulations, and other standards or practices to the standards of the WTO (Cattaneo & Braga, 2009, 19). It is worth to mention that under the unified structure of the WTO Agreement, the obligations of the acceding countries should be the same as those of the existing members. However, the specific provision of the WTO Agreement on accession for a certain country may not comply with that principle (Qin, 2003, 487). Therefore, more requirements may be imposed on acceding members than on existing members.

The accession requirements encourage countries to establish better institutions and improve economic situation. Each accession process is unique as different economic conditions are taken into account during negotiation. As this paper looks into the case of Russia, Russia´s accession process is discussed only. Despite the steps already taken to improve the legal and economic situation in Russia there is a certain amount of concern whether the laws are applied effectively. At this point Russian economy does not correspond to all the standards of a modern market economy and, therefore, there are still a lot of improvements that need to be done by Russia to comply with the WTO standards, which emphasize trade liberalization and the rule of law (Kerr, 2012, 150).

Amidst the most serious problems that still require a lot of attention are weak property rights, corruption and poor rule of law, as well as crony capitalism, when political decisions are heavily dependent on the business elite (Kerr, 2012, 154).

Mandatory external management for internal reform, that Russia is expected to obtain due to joining the WTO, is especially important as institutional stabilization is essential in Russia's development. According to Tarr & Volochkova (2010, 221) Russia will derive large benefits from the WTO accession and the largest ones will result from its own liberalization commitments. They argue that the WTO accession is a unique opportunity for Russia, as the commitments to comply with the WTO standards "lock in" the reform of institutional quality in such a way that it cannot be easily reversed by future less reform-minded administration.

Lapin (2012) argues that membership in the WTO will help to improve the rule of law, as Russia gave commitments to provide transparency of legislation affecting international trade. The acceptance of the WTO Government Procurement Agreement, that establishes rules against corruption, is an example of the actions taken by Russia to improve its rule of law. Among other WTO Agreements that are aimed at reducing corruption are Sanitary and Phytosanitary (SPS) and Technical Barriers to Trade (TBT) Agreements, as well as the Agreement on Customs Valuation.

During accession negotiations several structural reforms were demanded from Russia targeting at improving and stabilizing the legal system for economic activities (Vercueil, 2007, 10). The evidence of the legal system´s transformation were the twelve legislative texts that were issued with the direct reference to the WTO accession negotiations. Administrative registration procedures were simplified, companies obtained more rights during inspections (Vercueil, 2007, 15). Aiming at improving the business environment and the legal framework supporting it, Russia ratified the OECD convention on combating bribery in 2012 (Lapin, 2012).

Summing up, there are a lot of benefits for Russia in the WTO. The membership in the WTO will help to integrate Russia into the global economy, will bring higher certainty and stability to the internal market as well as trading partners, establish the rule of trade law (Lamy, 2011, 3). The commitments, that acceding members make, imply domestic economic reforms targeted at improving domestic efficiency, strengthening market institutions, therefore reducing the riskiness of international trade engagement with this country and potentially leading to higher trade. According to Kerr (2012, 152) this should definitely be the case for small economies, but for a large economy like Russia, there will be more efficient results only if Russia takes effort in further liberalizing its economy and establishing better institutions.

4 Impact of institutions on trade

Proper functioning institutions are important for the country as they reduce the costs of transaction of economic agents and structure interaction between them. It is required from domestic institutions to provide contract enforcement, protect property rights and ensure the rule of law. (Büge, 2010, 3) Such institutional factors as poor efficiency of bureaucracy, corruption, possibility of expropriation of private property by government create uncertainty among economic agents and discourage them from trading with the country (Faruq, 2011, 586). The aim of this chapter is to analyze the impact of institutions on trade from two different perspectives: by providing theoretical explanation of the influence of institutions on trade and discussing empirical evidence.

The analysis of the impact of domestic institutions on trade has attracted the attention of economists just recently. Most of the papers are focused only at the empirical research, without introducing any theoretical model. Only few papers develop a theoretical framework for their empirical analysis. Most of the papers that use a theoretical model base their theory on the model presented by Anderson and Young (2006). Hence, Fatica (2010) estimated the effect of institutional quality on FDI with the help of the theoretical framework that followed the ideas of Anderson and Young (2006) that poor institutions were the reason for additional costs facing market agents. The empirical research done by Anderson & Marcouiller (2002) analyzed the effect of insecurity on the patterns of trade flows. Their theoretical model was based on the earlier version (year 1999) of the paper by Anderson and Young (2006).

4.1 Impact of institutions on trade: theoretical framework

The impact of institutions on trade can be analyzed in various ways. The model by Anderson & Young (2000 (a)) shows that the presence of proper working institutions benefits trade by analyzing the direct impact of institutions on trade. In this model the implications of different institutional settings for traders are assessed and the situations of the Rule of law and the Anarchy as the extremes of the development of institutions are introduced. This model is important as it confirms that trade volumes depend on the availability of proper institutions. Another model by Anderson & Young (2006), includes some ideas from the model by Anderson & Young (2000 (a)), and develops a trade model with imperfect contract enforcement. This model shows that institutional improvement increases trade volumes. As this thesis is aimed at analyzing the possibility of Russian trade increase through the better quality of Russian institutions, the theoretical model by Anderson & Young (2006) is discussed in more detail. As well their model can be a good introduction to the empirical part of this thesis as it is possible to obtain the gravity equation from that theoretical

model. The working paper for the article by Anderson & Young (2006) was used as well to present specifications of some calculations.

In order to understand how the ability of institutions to enforce contracts influence trade volumes and whether the improvement of institutions will increase trade Anderson & Young (2006) create the model of equilibrium under imperfect contract enforcement. By introducing the notion of contract enforcement that stands for the probability of court to force the contract to be executed in case of the default of one of the parties from their obligations, they predict that contract insecurity reduces international trade. As there is a possibility of market failure better enforcement is beneficial to traders. In the context of international trade contracts should be enforced across countries. Enforcement will be at the level the home side permits it to be (Anderson & Young, 2006, 1). Thus contract enforcement between two countries will be strong only if both of them agree on the level of enforcement and each take measures to ensure it.

In the model risk neutral traders are randomly matched on the international market and transact one unit of the good in exchange for money. After agents have been matched, they start bargaining about the price on the spot market. The outside option for them is to sell the good at the home market, while bearing costs of returning the good back to the domestic market. There are costs to enter the international market and there exists an excess side of the market where agents do not find the matching pair. After entering the market trade costs are sunk and agents discover the random component of trade cost ($\mu^i; i = s, b$), that affects the ex post cost of returning home to make a deal, and decide whether to default and take the outside option. Therefore, the existence of the random shocks makes default from contract preferable in some situations.

In the case of a default the partner can appeal to court. The enforcement level is modeled by the probability that the defaulted contract will be enforced. As contract enforcement is imperfect, institutions sometimes do not punish the party that defaulted from the contract. Two situations are possible: the court will enforce the contract or the contract will be left unenforced. Only a portion θ of contracts in default will be enforced; $\theta \in [0,1]$. And the probability that the contract will be executed is $\beta = \varphi + \theta (1 - \varphi)$; the price of the execution will be the contract price p^c. The parameter β varies positively with θ and represents the enforcement policy variable. Meaning that the higher the β is, the more powerful the institutions are in enforcing contracts.

With an endogenously chosen enforcement, traders will want to have institutions that will support them in maximizing their economic returns. Thus, the sovereign nations will choose the strongest enforcement level (institutions) that will be supported by the traders from both countries.

The equilibrium match probability

In order to see how better institutions influence trade we have to determine the equilibrium match probability. The match probability in the equilibrium is the probability that the contract will be executed. The higher the match probability is, the more contracts will be executed, thus the higher will be the trade volume.

There will be either excess demand or excess supply on the market unless supply equals demand: s[p*–c] = d[b–p*], where p* is the expected bargaining price after the match, *b* and *c* are the prices in the domestic market in the case the agent was not matched and sells or buys at the home market. Considering the excess demand equilibrium, the probability for a buyer to make a random match is:

$$\pi = \frac{(1-\beta)s[\widetilde{p^s}-c]}{d[b-p^b]-\beta s[\widetilde{p^s}-c]} \quad (1)$$

Where p^b is the price in excess demand equilibrium and $\widetilde{p^s}$ is the expected price for the scarce side trader in excess demand equilibrium unconditional on default (in excess demand equilibrium the scarce side traders are represented by suppliers). The numerator on the right hand side is represented by the number of sellers active on the market, whose contracts are broken. The denominator is the number of the buyers active on the market that is the total number of buyers who wanted to trade minus those whose contracts are executed.

To understand how the ability of institutions to enforce contracts influence trade volume, Anderson & Young (2000b) find the influence of the enforcement level β on the equilibrium match probability, by differentiating the RHS of (1) with respect to β using:

$\frac{\partial \Pi}{\partial \beta} = f_\beta / (1 - f_\pi)$ and obtain that $f_\beta = \left[-(1-\pi) + (1 - \beta + \beta\pi)\frac{\varepsilon^S}{\widetilde{P^S}}\frac{\partial \widetilde{P^S}}{\partial \beta}\right]\frac{\pi}{1-\beta}$ (2)

$$\frac{\partial \widetilde{p^s}}{\partial \beta} = p^b - p* + (1 - \pi)\mu^D = (1 - \pi)(b - p* + \pi^D) > 0, \quad (3)$$

(where $\varepsilon^S \equiv \widetilde{p^s}$s/s and μ^D= E $(\mu^b | \mu^b < \mu *^b)$)

The first term under the brackets in (2) is negative and it shows the direct effect of increasing β on the match probability. It means that there are fewer sellers available due to increased number of binding contracts. The second term is positive and it can be interpreted as follows: with higher β the ratio of sellers to buyers becomes higher as the sellers expected price rises, increasing the

probability of a match. If sufficiently large elasticity of supply is assumed, the second effect is dominating and π increases in β.

It should be mentioned that there is an exception from the model when it includes parameters that stand for low stages of economic development. In this case there exists low enforcement equilibrium that is observed for developing countries. Low enforcement equilibrium is a trap for developing countries, as a better equilibrium is far away.

The result of the model is that when contract enforcement is imperfect and assuming large price elasticity of supply, all traders prefer better enforcement as it increases their probability to be matched. As the probability of the match is increasing in contract enforcement it means that trade volume increases with the enforcement of the contracts by institutions, which means that better quality institutions encourage higher trade. A country with institutions of high quality is more likely to be able to better enforce the rule of law, hence ensuring a free, fair, and competitive market (Yu , 2008, 2). Thus, it is important for the policymakers in the transition countries, Russia in particular, to recognize that markets' success depends strongly on the adequate institutions. Often it is better to gradually build on available institutions, rather than creating replicas of the institution in the developed world from scratch (Dixit, 2004, 4).

In order to show the relevance of the theoretical model for the empirical research in this thesis, the Author obtains the gravity equation from the model. In order to do that, the Author follows the idea by Anderson & Marcouiller (1999) that use the probability of the successful shipment between countries *i* and *j* to derive the gravity equation.

The Author of the thesis obtains the following probability of the successful shipment between two countries from the model by Anderson & Young (2006):

$$\pi_{ij}=\pi_i\pi_j = \frac{(1-\beta_i)s[\widetilde{p^s}-c]}{d[b-p^b]-\beta_i s[\widetilde{p^s}-c]} * \frac{(1-\beta_j)s[\widetilde{p^s}-c]}{d[b-p^b]-\beta_j s[\widetilde{p^s}-c]} = \frac{(1-\beta_i)(1-\beta_j)s[\widetilde{p^s}-c]s[\widetilde{p^s}-c]}{(d[b-p^b]-\beta_i s[\widetilde{p^s}-c])(d[b-p^b]-\beta_j s[\widetilde{p^s}-c])} =$$

$$\frac{(1-\beta_i)(1-\beta_j)}{\left(\frac{d[b-p^b]}{s[\widetilde{p^s}-c]}-\beta_i\right)\left(\frac{d[b-p^b]}{s[\widetilde{p^s}-c]}-\beta_j\right)} = \frac{1-\beta_j-\beta_i+\beta_j\beta_i}{\left(\frac{d[b-p^b]}{s[\widetilde{p^s}-c]}-\beta_i\right)\left(\frac{d[b-p^b]}{s[\widetilde{p^s}-c]}-\beta_j\right)} = \frac{\beta_i\beta_j\left(1+\frac{1}{\beta_i\beta_j}-\frac{1}{\beta_i}-\frac{1}{\beta_j}\right)}{\left(\frac{d[b-p^b]}{s[\widetilde{p^s}-c]}-\beta_i\right)\left(\frac{d[b-p^b]}{s[\widetilde{p^s}-c]}-\beta_j\right)}; \quad (4)$$

Assume costs are represented by D, which is the distance between the two countries:

$$D \equiv \frac{\left(1+\frac{1}{\beta_i\beta_j}-\frac{1}{\beta_i}-\frac{1}{\beta_j}\right)}{\left(\frac{d[b-p^b]}{s[\widetilde{p^s}-c]}-\beta_i\right)\left(\frac{d[b-p^b]}{s[\widetilde{p^s}-c]}-\beta_j\right)} \quad (5)$$

As the enforcement will be at the level the home side (importer country) permits it to be (Anderson & Young, 2006, 1), contract enforcement will be at the level of the importing country β_i. Thus β_j will be at the level of β_i in the term D ($\beta_j = \beta_i$):

$$D \equiv \frac{\left(1+\frac{1}{{\beta_i}^2}-\frac{2}{{\beta_i}^2}\right)}{\left(\frac{d[b-p^b]}{s[\widetilde{p^s}-c]}-\beta_i\right)^2} \quad (6)$$

Thus, the expression for π_{ij} is:

$\pi_{ij}=\pi_i\pi_j=\beta_i\beta_j D$, where $D \equiv \frac{\left(1+\frac{1-2{\beta_i}^2}{{\beta_i}^2}\right)}{\left(\frac{d[b-p^b]}{s[\widetilde{p^s}-c]}-\beta_i\right)^2}$. (7)

The obtained result is comparable to the gravity equation obtained by Anderson and Marcouiller (1999, 6). The probability of successful shipment π_{ij} can be reflected by a price markup on imports by country i from country j. The price markup at the same time influences import demand as import demand depends on these prices (Anderson and Marcouiller 1999, 6-8). Thus, the term π_{ij} can be proxied by the import of country i from country j. β_i and β_j stand for the quality of institutions, the quality is the higher, the higher is the probability of contract enforcement. D is the distance between the two countries. The main idea of the obtained gravity equation is that the volume of trade depends on the strength of the institutions to enforce contract in the two countries and the distance between the two countries.

4.2 **Impact of institutions on trade: empirical evidence**

Only a few empirical studies measure the importance of institutions for trade. Anderson & Marcouiller (2002) concluded that corruption and imperfect contract enforcement dramatically reduced international trade. By estimating the gravity equation they found out that insecurity caused by imperfect institutions reduced import demand in a same way as hidden tax. Inadequate institutions influence trade as much as tariffs do. Insecurity of trade, such as lack of mechanism to enforce contracts, bribes by custom officials and possibility of hijack, can be represented as hidden transactions costs that reduce the amount of trade. On the one hand, trade is reduced in the presence

of imperfect institutions because the traders have to increase prices in order to cover for the costs that they face due to insecurity. On the other hand, when there exist courts, tax collection agencies and bureaucracies, which enforce contracts and protect property rights for secure exchange, transactions costs are lowered for the trading partners leading to the increase of international trade volume. Büge (2010) showed, by using such empirical methods as OLS, Poisson and IV, that trade insecurity influenced the degree of uncertainty of economic agents, as trade costs caused by bribes, extortion, or theft were much less predictable. According to empirical evidence an improvement by 10 % of the quality of institutions and lowering the degree of uncertainty would increase trade by 3,8 % (Büge, 2010, 22). Nunn (2007, 570) found that countries, where institutions were able to support good contract enforcement, specialized in industries with the importance of relationship-specific investments. Patterns of trade between countries could be explained more by contract enforcement than countries' endowments of physical capital and skilled labor combined.

The research done by Berkowitz et al. (2006) complemented the one done by Anderson & Marcouiller (2002) and stated that good institutions of the importer influenced trade by lowering the predation risk. Furthermore they concluded that good institutions in the exporter's country could boost international trade, especially trade in complex products, because they minimized exporter's incentive to violate contracts. The conclusions by Berkowitz et al. (2006) had an important implication that political actors could indirectly influence trade flows by improving institutions. Following the study by Berkowitz et al. (2006), Ma et al. (2011) researched how institutional quality affected exports at a firm level in developing and transition countries and provided evidence, by using Tobit and IV methods, that better institutions resulted in higher exports of complex goods.

As Russia is the focus of this thesis, it makes sense to look at the example of a country with comparable structure of economy to understand future prospects for Russia after the WTO accession. China, that became the WTO member in 2001, is a good benchmark as it also has an emerging market and is a member of the BRICS that includes the countries with similar type of influence in the international political and economic system (Armijo, 2007, 9). Yu (2008), by estimating the gravity equation and using OLS, PPML and IV methods, found that the main reason of China´s trade increase after joining the WTO was the influence of the WTO on the quality of institutions.

Other countries, that can be a possible benchmark, are the Eastern European countries and the CIS countries. Schuler (2003) researched the impact of institutions on trade for Eastern Europe and the former Soviet Union countries. He provided evidence that weak institutions were the reason of low exports of complex goods in the former Soviet Union countries and Eastern Europe during the early

years of transition. Schuler stated that weak institutions were the obstacle to the investments in the skilled labor intensive industries in the transition countries. Thus, they prevented those countries from exploring competitive advantage and benefiting from trade. In the research done by Babecká Kucharčuková O. et al (2012, 295) low institutional quality in the CIS countries denoted the biggest obstacle to higher trade volumes. Quality of institutions was more important for trade than geographical disadvantages resulting from distance to major markets. They assumed that the WTO membership could improve trade volumes in the CIS and trade increase would be reinforced in case of institutional improvement.

In conclusion, both theory and empirical evidence show that weak institutions represent significant and quantitatively large barriers to trade. According to empirical evidence for several countries better functioning institutions facilitated the increase of bilateral trade flows. Therefore, it can be assumed that the improvement of Russian institutions will as well increase its trade.

5 Gravity Model and Methodology

This part of the thesis concentrates on explaining the gravity model that is used in the empirical part. First, the gravity model and the theory it is based on is explained. Second, the particular gravity equation used for this thesis is presented. Third, the motivation for the choice of the empirical methods is described.

5.1 Gravity Model

The gravity model of trade has long been one of the most successful empirical models in economics. The model works well empirically, explaining a large part of the variation in bilateral trade, by estimating bilateral trade flows to GDP, distance and other factors that affect trade barriers. The gravity equation states that the product of two countries GDP's is directly proportional to the trade between them. The gravity model predicts that larger countries are more likely to trade more with each other, and countries with comparable sizes will also tend to have more trade with one another (Feenstra, 2003). With higher levels of GDP and lower transaction costs, measured as distance between the countries, trade flows will be higher. Anderson & Wincoop (2003, 171) state that if resistance to trade between the country and the rest of the world is observed, the country trades more with a given bilateral partner. This can be explained by the fact that a bilateral barrier between two regions influences trade less than the average barrier of the two regions with all their partners. Evenett et al. (2002) believe that perfect specialization accounts for the success of the gravity equation to predict variation in bilateral trade flows between two countries.

The gravity model has a long history of use. Ravenstein (1889) was the first one to implement gravity for migration patterns in the 19th century. Tinbergen (1962) was first to use the equation to explain trade flows. Since then the gravity model has been used by mane researchers to estimate trade flow effects of customs unions, exchange rate mechanisms, ethnic ties, linguistic identity and international borders.

The traditional gravity model predicted the movement of goods between two countries similar to the Newton's Law of Gravitation. The supply of goods from country of origin is attracted to the demand for goods at the country of destination, but the distance between countries reduces the potential flow (Anderson 2011, 2). Later the traditional gravity model, which was based only on two variables, was improved by adding other proxies for trade frictions, such as the influence of geographic distance, common border, official language, regional trade agreement, religion and colonial history (Linders & Groot 2006, 3).

The standard model has a challenge with zero-valued bilateral trade flows. Most of the studies ignore zero flows in the analysis of bilateral trade. This results in neglecting important information for understanding the patterns of bilateral trade (Linders & Groot, 2006, 3).

Since the gravity equation was first derived, the economists have shown that the same equation can be obtained from different trade theories (Filippini & Molini, 2003). Anderson (1979) was one of the first to develop a theoretical framework to derive the gravity equation. He provided a model that determined trade flows by the demand side, assuming complete specialization of countries. Deardorff (1998) showed that the demand side model by Anderson (1979) was compatible with the classical/neoclassical and new trade theory. Eaton & Kortum (2002) assumed that the levels of technology differed by country and derived the gravity equation based on the Ricardian trade model with a continuum of goods. Chaney (2008) and Melitz & Ottaviano (2008) obtained the gravity equation from the new-new trade theory that focused on the importance of the firm, not the countries in international trade (Ciuriak, 2011).

As mentioned previously, different international trade theories lead to the same gravity equation. In this thesis the generalized gravity model is derived from the demand side model specifying the expenditure function of the consumers to be a Constant Elasticity of Substitution (CES) function used by Anderson (2011) and Anderson & Wincoop (2003). In the demand side model exogenous supply of goods is assumed for countries. Countries produce fixed quantity of a unique bundle of goods (Ruiz & Vilarrubia, 2007, 12). In this case only the demand of the target country influences trade flows.

The consumer in the importer country (country *i*) maximizes the following utility function (Anderson & Wincoop, 2003, 177):

$$U\,(x_{eit}) = \left(\sum_e \beta_{et}^{\frac{1-\sigma}{\sigma}}\, x_{eit}^{\frac{\sigma-1}{\sigma}}\right)^{\frac{\sigma}{\sigma-1}} \text{, with } \sigma > 1 \qquad (8)$$

Subject to the budget constraint:

$$\sum_e p_{eit} x_{eit} = y_{it} \qquad (9)$$

Where x_{eit} are country *e* exports to country *i* in period *t*, $\beta_e^{\frac{1-\sigma}{\sigma}}$ is the number of goods produced by country *e*, σ represents the elasticity of substitution between goods from different countries, p_{eit} is the c.i.f. import price from country *e* to country *i* at time *t* and $y_{it}$is the nominal income of country *i* at time *t*. With the presence of transportation costs country *e´*s export price becomes p_{eit}=$p_{et}\cdot t_{eit}$

where $p_{et}$is the export producer price and (t_{eit}–1) is the amount lost to shipping, interpreted as trade costs.

By solving the optimization an import demand equation is obtained:

$$x_{eit} = y_{it}\left(\frac{\beta_{et}p_{et}t_{eit}}{P_{it}}\right)^{1-\sigma} \quad (10)$$

where P_{it} is the price index of the country *i* at time *t:*

$$P_{it} = (\sum_e(\beta_{et}P_{et}t_{eit})^{1-\sigma})^{\frac{1}{1-\sigma}} \quad (11)$$

By introducing market clearance ($y_{et} = \sum_i x_{eit}$) and noting y_{wt} as the world income, the structural gravity model can be obtained, showing bilateral trade flow for countries *e* and *i:*

$$x_{eit} = \frac{y_{et}y_{it}}{y_{wt}}\left(\frac{t_{eit}}{P_{et}P_{it}}\right)^{1-\sigma} \quad (12)$$

In equation (12) P_{et} and P_{it} are outward and inward multilateral resistance terms, that aggregate bilateral trade costs and decompose their influence on the producers and the consumers. Outward multilateral resistances are understood as if the sellers in each country shipped to a single world market and inward multilateral resistances as if there was a single world market for the buyers to import from (Olivero & Yotov, 2012, 71).

The equation (12) cannot be empirically estimated as the multilateral resistance terms are not observable. Anderson & Wincoop (2003) suggest estimating (12) with non-linear methods by expressing P_{et} and P_{it} as non-linear combinations of y_{it}, y_{et}, and t_{eit}, or replacing these terms with fixed country effects. $\ln t_{eit}$ can be assumed to be a bilateral trade barrier (Hornok, 2012, 5). In this thesis bilateral trade barrier is represented by the weighted distance between countries, as it reduces trade due to the increasing transaction costs and may lead to greater risk of misappropriation of goods during shipment.

In this thesis the gravity model specification by Lissovolik & Lissovolik (2006) will be used and additional independent variables necessary for the estimation will be included. Two separate gravity equations will be estimated: for Russian export and Russian import in order to compare how the quality of institutions influence Russian export and import separately. Most gravity models have a multilateral setup, while only Russia's pairwise trade with other countries will be investigated in this thesis. According to Lissovolik & Lissovolik (2006, 11) the country-centered specification allows to focus on idiosyncratic patterns of Russia's foreign trade through a more precise modeling of the country-specific parameters.

The specific form of the equation that will be estimated is the following:

$$lnX_{rus(i)} = lnD_i + \ln(Y_{rus} * Y_i) + \ln(y_{rus} * y_i) + Comborder + Comlanguage + \\ + Inst_{rus} + Inst_i \quad (13)$$

Where $X_{rus(i)}$ stands for Russian exports to country i or country i's export to Russia[2]; D_i is the weighted distance between Russia and country i; the two following terms denote the products of Russia's and partner's GDPs and GDPs per capita respectively. Comborder and Comlanguage are the dummy variables that capture if Russia's trading partner shares a border or has the same language as Russia. As it was shown in the theoretical model in Chapter 4.1, it is important to include in the gravity model the institutional variables, both for the country of interest and its partner. Therefore, the variables for the quality of the Russian institutions and Partner institutions, $Inst_{rus}$ and $Inst_i$ respectively are included.

In conclusion, the specific form of the gravity equation that is used in the empirical part of this thesis is comparable to the one derived in the theoretical part (Chapter 4.1). In both cases the level of import (or export) depends on the distance between the two countries and the quality of their institutions. The gravity equation in the theoretical part has a shorter form, while the one used for the empirical part contains several additional variables that are usually included in the gravity equation. It should be noticed that the model in the theoretical part assumes large price elasticity of supply, while supply is completely inelastic in the model above. This difference is negligible because different trade theories lead to the same gravity equation, as it was discussed previously. Therefore, the form of the equation described above will not change in case the assumption of inelastic supply is dropped.

5.2 **Methodology**

The aim of this thesis is to study how Russia's own institutions and its partners' institutions influence its trade, and to answer the main question whether the increase of the quality of Russian institutions, encouraged by the WTO membership, will increase its trade flows. This section describes possible problems that may arise in the empirical model and introduces methods that are used to obtain proper estimations.

2 As Import data is estimated in CIF, and export data is estimated in FOB, in order to obtain comparable results for Russian export and import I use only export data (export data from Russia to its partners and export data from Russian partners to Russia)

5.2.1 Missing trade problem

According to the empirical papers, discussed in the Chapter 2, that assess the influence of the WTO on trade, missing trade problem is a very important issue that should be carefully considered in order to obtain proper results. The recent papers, like Roy (2011), Liu (2009), state that not controlling for the zero trade flows may lead to biased results.

Most of the studies assessing the impact of the WTO on Russian trade do not pay special attention to this problem. Babecká Kucharčuková (2004), Brock (2006) and Kolesnikov & Podkorytova (2011) do not address the issue of zero trade at all, Lissovolik & Lissovolik (2006) transform the data in various ways: by adding 1 to the number under the logarithm and by assigning negligible values to the missing observations.

Silva & Tenreyro (2006, 653) argue that standard empirical methods of estimating the gravity equation, such as OLS (Ordinary Least Squares), are inappropriate. Log-linearization in the standard methods is incompatible with the data containing zeros as zero-trade pairs are eliminated in those methods. In order to avoid significant bias of the OLS estimation Silva & Tenreyro (2006) introduce a Poisson Pseudo Maximum Likelihood (PPML) estimator that does not require taking a logarithm from the dependent variable. According to Fratianni et al. (2010) in the presence of country and year fixed effects and country-pair random effects and a large number of zero-values in the dataset it is optimal to use PPML. Even if there is a large proportion of zeros in the data it does not affect the performance of the PPML estimator (Silva & Tenreyro, 2011, 222).

To define the PPML estimator Tenreyro (2007) uses the gravity equation in its exponential form:

$$T_{ij} = \exp(x_{ij}\beta) + \varepsilon_{ij} \tag{14}$$

where the vector x_{ij} consists of explanatory variables (some of which may be linear, some in logarithms and some dummy variables (Martin & Pham, 2008, 8)). If $E(\varepsilon_{ij}|x) = 0$, the PPML estimator is represented by:

$$\widetilde{\beta} = \arg\max_b \sum_{i,j}^{n} \{T_{ij} * (x_{ij}b) - \exp(x_{ij}b)\} \tag{15}$$

Implying the set of first order conditions:

$$\sum_{i,j}^{n}\left[T_{ij} - \exp\left(x_{ij}\tilde{\beta}\right)\right]x_{ij} = 0 \quad (16)$$

For the estimator to be consistent the correct specification of the conditional mean is required, that is, $E\left(T_{ij}\middle|x_{ij}\right) = \exp(x_{ij}\,\beta)$. Therefore, this estimator is similar to a Generalized Method of Moments (GMM) estimator that solves moment conditions in equation (16). The PPML identifies the coefficients using the same first-order conditions used by the maximum-likelihood estimator derived from the Poisson distribution (Fally, 2012, 8). But for the estimator based on the Poisson likelihood function to be consistent, the data do not have to correspond to Poisson properties and T_{ij} does not have to be an integer (Silva & Tenreyro, 2006, 645).

Because there is a considerable amount of zero observations in the data used for this thesis, and as the zero trade problem was not specifically addressed in the research for the Russian trade, the PPML estimator, described above, is an appropriate estimation method for this thesis.

5.2.2 Endogeneity of institutions

When estimating the influence of institutions on trade, reverse causality should be considered. Dollar and Kray (2003) argue that the relationship between trade and institutions is bidirectional. Improved quality of institutions can result in more trade while at the same time trade increase may encourage improvement of institutions. The unaddressed problem of the endogeneity of the institutions may lead to obtaining biased estimates. In order to prevent such bias Instrumental Variable (IV) method is used in this thesis.

According to Nichols (2007) the Instrumental variable method introduces another set of variables *z* correlated with x^T but not correlated with the error term, e.g. ε in

$$y = x^T\beta_T + x^C\beta_C + \varepsilon \quad (17)$$

The set of instruments *z* should satisfy following conditions: $E(z'\varepsilon) = 0$ and $E(z'x^T) \neq 0$. With such specifications of the instruments it is possible to estimate the impact of x^T on *y*.

It is important to mention that the IV estimations are only as good as the instruments used. Good instrument should correlate with the variable and not correlate with the variable's error term. In case of this thesis, the instruments for institutional variables should have an impact on institutions, but not directly influence bilateral trade levels. The instruments that will be discussed below were

chosen as they proved to be appropriate instruments in several papers assessing the quality of institutions. The quality of the instruments will be discussed in more detail in Chapter 7.3.1.

Researchers usually include several estimation methods for the same database as each method has its advantages and disadvantages and it cannot be asserted that any one of them absolutely outperforms the others. In this thesis three methods will be used: OLS, IV and PPML. Postestimation tests will be performed in Chapter 7.3 in order to compare those methods.

6 Variables and Data

This chapter describes the panel data used in this thesis. The data consists of country pairs and years in the estimation. The dataset consist of 197 Russian partners for export (import) for 12 years (2000-2011), with some countries excluded due to poor data availability. The zero observations were kept for PPML estimations. As the availability of data differs for export and imports, there is different amount of zeros present in the export and import data.

The data is collected from several sources. The trade data was collected from the United Nations Commodity Trade Statistics Database. The Data on the GDP and the GDP per capita was collected from UNCTAD database. The data for institutional variables was obtained from The Worldwide Governance Indicators (WGI). The data on dummy variables, distance, instrumental variables was collected from diverse sources. The data was obtained as the currency of the United States and deflated in the prices of the year 2005.

6.1 Variables

In this chapter general gravity model variables are described, such as trade flows, distance and GDP, as well as institutional variables, instrumental variables and additional variables.

Common gravity equation variables

Export The dependent variable is characterized by the natural logarithm of exports from country of origin to the country of destination. In contrast, the regressand for the Poisson Pseudo Maximum Likelihood (PPML) estimator is in levels, and not in logarithms. Although the mean is still specified in the logarithm form, i.e. the logarithm of the mean is linear in the variables. The nominal data on Exports in American dollars is obtained from United Nations Commodity Trade Statistics Database. The data in the database is available in different classifications. For this thesis the total amount of export from one country to another is taken from the dataset, classifying the data by Broad Economic Categories (BEC), as this classification is suitable for the general economic analysis of international trade data (OECD, 27.01.2013). To obtain the real values of exports, the Author uses Consumer price index (CPI, 2005 = 100), following Yu (2010, 293). The data on CPI is obtained from the World Bank Development Indicators.

Product of real GDPs Real GDP is one of the main variables in the gravity equation. It is expected that there will be positive effect of GDPs on bilateral trade, because the idea behind it is that higher income countries are likely to trade more with each other (Khatibi, 2008, 3). The levels of the

countries GDP's should affect positively their bilateral trade. The data for the GDP (in constant US dollars, base year 2005) was obtained from the UNCTAD database.

Product of real GDPs per capita (GDPcap) GDP per capita is usually included to measure the influence of the level of the country's development on trade. The data for the GDP per capita (in constant US dollars, base year 2005) was obtained from UNCTAD database.

Distance As Russia has a big territory simple distance estimation that is taking into account only the distance between capitals cannot be used. Instead it is preferred to use weighted distances, for which the data on principal cities in each country is taken into account. CEPII's distances measures were used to estimate the distance. The weighted distance measure takes into consideration the geographic distribution of population inside each nation. The general formula for calculating distance between countries *i* and *j* presented by Mayer &Zignago (2011, 11) is:

$$d_{ij} = \left(\sum_{k \in i}(pop_k/pop_i)\sum_{l \in i}(pop_l/pop_j)d_{kl}^{\theta}\right)^{1/\theta} \quad (18)$$

where pop_k is the population agglomeration k belonging to country i. Parameter θ measures the sensitivity of trade flows to bilateral distance d_{kl}. It is set to equal to -1, which corresponds to the usual coefficient estimated from gravity models of bilateral trade flows.

Some studies include exchange rate volatility as a variable in the gravity equation. It is not included in this thesis as according to Tenreyro (2007, 485) exchange rate variability has no significant impact on trade flows. Maurel (2004) provided justifications of the ambiguous impact of exchange rate volatility on trade.

As stated by Anderson & Marcouiller (2002, 344) it is important to consider if the trade partners share a common border or a common language, because those factors may improve the exporter's skill in using the institutions of the importing country to protect the shipments.

Common language It can be assumed that transaction costs for countries with same language will be lower (Bussière & Schnatz, 2006, 13). Usually the official language data is used to estimate the gravity equation, but according to the recent study by Egger & Lassmann (2012, 224) there is a big discrepancy between the results of the equation if the official or the spoken language is used. For the case of Russia, the Author believes that the results will be more precise if spoken language is used as in most former USSR countries there is a significant share of population speaking Russian language, although it is not official in those countries. The information on common language is

taken from the CIA World Factbook. The language variable is 1 if the countries share the same language and 0 otherwise.

Common Border The international border significantly affects transaction costs. If trading partners share a common border they are expected to trade more (Ghemawata et al, 2010, 420). The information for this variable is obtained from the CIA World Fact book. The dummy gets value 1 if Russia shares a common border with a country and 0 otherwise.

Institutional variables

The quality of the institutions cannot be directly observed. The only possibility to assess institutions is to use objective data such as the quantity of officially reported cases of corruption or the frequency of the government changes (Büge, 2010, 8). Indicators that represent a numerical illustration of complex phenomena are a good tool to use when an unobservable complex phenomena needs to be given a simpler and more comparable form (Davis et al, 2012, 8). In this thesis institutions are measured based on several institutional scores, obtained from The Worldwide Governance Indicators (WGI).

The Worldwide Governance Indicators (WGI) are provided by the World Bank and show the quality of governance based on the view of large number of enterprise, citizen and expert survey respondents in industrial and developing countries. According to Belke et al. (2009, 7) WGI is the most comprehensive measure of institutional development calculated for international comparisons.

The Rule of law represents a system where the government is accountable under the law, laws are stable and fair, the processes enforcing the law are efficient and justice is delivered by competent independent representatives[3]. The Rule of law indicator is a good benchmark for the quality of institutions as it shows the confidence of the agents that the rules of law are followed in society, particularly the quality of contract enforcement, protection of property rights and the efficiency of courts.

With the two other indexes it is possible to evaluate the quality of administration in the country and to estimate whether the government is capable of formulating sound policies. They are chosen for this thesis as they represent the most relevant governance dimensions (Daude & Stein, 2007, 329).

The Regulatory quality index shows the perception of the citizens of the ability of the government to implement proper policies and regulations that encourage economic development.

3 See: The World Justice Project. What is the rule of law? Available at: http://worldjusticeproject.org/what-rule-law

Government effectiveness index describes the perception of the quality of public and civil services, their independence from political pressure and the trust of the economic agents that the government will commit to the policies.

All the indexes described above are rescaled to range from 0 to 10, with 10 being most desirable situation. As better institutions encourage trade, the correlation between the quality of institutions measures and trade flows is anticipated to be positive. According to Kaufmann et al (2010, 4) the indexes are interdependent as they measure similar areas of the institutional quality. In order to avoid possible correlation between the variables, the Author follows Babecká Kucharčuková O. et al (2012) and takes the arithmetic average of the described indexes to obtain the institutional variables for Russia and for its partners.

Instrumental variables

Infant mortality rate is the annual number of deaths of infants under age 1 per 1,000 live births. It defines the probability of dying between birth and exactly one year of age during the period 2000-2005. The infant mortality rate is an appropriate instrumental variable as the mortality rate in a country is highly correlated with the institutional quality but weakly correlated with trade (Yu, 2008, 16). The data on the infant mortality rate is obtained from the United Nations World Population Prospects.

ELF The index of ethnolinguistic fractionalization measures the likelihood that two persons drawn randomly from a country's population will not belong to the same ethnolinguistic group. This index was first used by Mauro (1995) to control for endogeneity in the research of the influence of corruption on economic growth. Later it was used by Faruq (2011) to assess the influence of institutions on export quality. When different ethnolinguistic groups are present in the country political tensions may occur between them. This may result in more corruption and unnecessary regulations by bureaucrats to favor their own ethnolinguistic groups. The ELF variable contains the ELF index for partner countries. It is not expected to be directly related to exports, which makes it an appropriate instrument for institutional quality. The information on the index is obtained from Roeder (2001).

6.2 **Descriptive analysis of the data**

In this part overall characteristics of the data are gone through. Table 4 below represents the characteristics of the whole dataset with separate information on Russian exports and imports.

Table 4: Descriptive statistics of variables (2000-2011)

	Import					Export				
Variable	Obs.	Mean	Std. Dev	Min	Max	Obs.	Mean	Std. Dev	Min	Max
Import (Export)	2388	7,36e+08	2,81e+09	0	4,73e+10	2388	1,60e+09	6,04e+09	0	1,08e+11
Log Import (Export)	1463	17,293	4,025	3,095	24,581	2064	17,389	3,861	0,487	25,406
Log Distance	2388	8,589	0,684	6,754	9,650	2388	8,589	0,684	6,754	9,650
Log pr. Real GDP	2264	23,113	2,440	16,635	30,162	2264	23,113	2,440	16,635	30,162
Log pr. real per capita GDP	2252	16,711	1,677	13,024	20,170	2252	16,711	1,677	13,024	20,170
Common border	2388	0,070	0,256	0	1	2388	0,070	0,255	0	1
Common language	2388	0,061	0,239	0	1	2388	0,060	0,238	0	1
Institutions Russia	2388	3,813	0,322	2,94	4,094	2388	3,813	0,322	2,94	4,094
Institutions Partner	1784	4,989	1,950	0,027	9,180	1784	4,989	1,950	0,027	9,180

According to the information obtained from Table 4, we can see that there is a considerable amount of zero observations (39% for import and 14% for export). That means that the PPML estimator may be more efficient than OLS in this case, as zero observations are not lost in the PPML method. The big amount of zeros can be explained, first, by the large amount of countries that are considered in this thesis, including small countries that might not trade with Russia for certain periods of time, second, by the fact that the data was obtained from one source and in one classification. The reason for using only one source is to obtain comparable, trustworthy results. The United Nations Commodity Trade Statistics Database is a good choice as it is considered the most comprehensive trade database available with more than 1 billion records.

Table 4 makes it clear, that Russian export is higher than Russian import. Figure 1 below represents the development of Russian total real export and real import in millions of dollars in more detail.

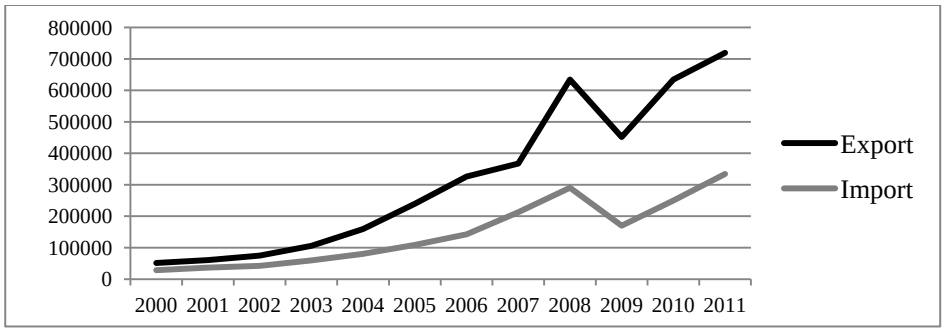

Figure 1 Development of Russian export and import (calculated by the Author)

As it can be observed from Figure 1, Russia is a net exporter country, with its export higher than its import in all the years. Overall, both export and import of Russia display increasing trends over the years 2000–2011. Otherwise smooth development of the trade flows has a peak in 2008 and a fall in 2009. The reason for the increase of export in 2008 was the favorable situation on the world market of mineral resources. Because mineral resources constitute a big part of Russian export, the favorable situation on the market led to an increase of Russia's share in the world exports from 1,05% in 2000 to 2,9% in 2008, however, a sharp decline in energy prices, noted in 2009, led to a reduction in this percentage to 2,17%. The import growth before the global financial crisis was caused by the demand growth in the domestic market and, hence, the increase in the physical volume of goods bought from abroad (Merkulov, 2012).

As stated in Table 4, the average quality of Russian institutions during the years 2000-2011 has been lower than the average quality of the Partners' institutions. This shows the potential for the quality increase of the Russian institutions. Figure 2 shows how Russian institutions were developing in time. As European institutions will be used later in this thesis, as a benchmark of the increase in quality of the Russian institutions, Figure 2 presents as well the development of the average quality of the institutions in the EU.

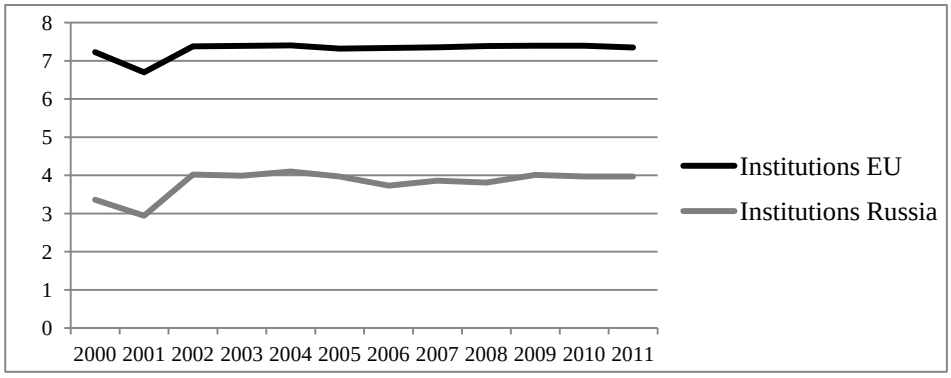

Figure 2 Development of Russian and EU institutions (calculated by the Author)

Figure 2 shows a rather steady development of institutions over time with Russian institutions being a bit more volatile due to the fact that the score for the EU institutions is the average score for the EU countries. A drop in the quality of institutions is seen in the year 2001. The changes over time of the WGI indicators, that were used to construct institutional variables, reflect a combination of three factors: the changes in the underlying source data, the addition of new data sources that are only available in the more recent period, and the changes in the weights used to aggregate the individual sources. Therefore, the drop in 2001 is most probably due to one of those factors. It is important to mention that the changes in the indicator over short year-to-year periods are difficult to measure with any kind of data, and are typically quite small. Therefore, it is recommended not focus on short-run year-to-year changes but rather on trends over longer periods, such as a decade (Worldwide governance indicators, 20.09.2012)

The fact that institutional variables vary little over time, as it is seen in Figure 2, has been a concern of several researchers. Therefore, Baccaro & Rei (2007) suggested using averaged data over the years. The drawback of this approach is that averaging the data does not allow to see short term effects. Moreover, they found that the results of the estimations with annual data were largely similar to those obtained with five-year averages. Another concern with the institutional variables that do not vary sufficiently over time is the use of the fixed effects method. Thus, Prakash & Potoski (2006, 358) as well as Beck & Katz (2001, 493) stated that the fixed effect approach had sufficient drawbacks when it was used to observe the influence of institutions and democracy on the dependent variable.

For this thesis, it should be taken into consideration that the institutional variables, varying little over time, are likely to produce coefficient estimates that will vary the most across different estimation methods (Baccaro & Rei, 2007). Therefore, the coefficients should be interpreted with attention paid to this fact. The institutional variables used in this thesis are obtained by taking an arithmetic mean of three different indexes. This may result in the institutional variable varying even less over time than the separate indexes, making the problem of little variation worse. In order to justify for the averaging of the indexes in this thesis, the indexes are included in the equation one at a time and the first stage of the IV method is performed to see if one of those variables works better. The results of the estimation are discussed in Chapter 7.2.

To conclude, the simple analysis of the data is not enough to establish the relationship between trade and the Institutional variables. It is required to use more complicated empirical methods that are described in the following chapter.

7 Empirical results

This chapter starts with the discussion of the estimation procedures that were used to choose more appropriate econometric methods. Then the results of the empirical estimations are presented with special attention on the impact of Partner and Russian institutions on Russian trade, followed by additional post estimation tests that help to understand which empirical model describes the data better.

7.1 General empirical results

The empirical estimation is started with a simple OLS regression and performing post estimation tests on it in order to understand the data better. First, the model is checked for heteroskedasticity, because if the errors are heteroskedastic it cannot be expected that the model will provide unbiased estimates of mean effects. The OLS method makes the assumption that variance of the error term is constant, $V(\varepsilon_j) = \sigma^2$ for all j. If the error terms do not have constant variance, they are heteroskedastic. When the standard errors are biased, a bias in test statistics and confidence intervals occurs.

Breusch-Pagan / Cook-Weisberg test is used in this thesis to test for heteroskedasticity. The null hypothesis is that the error variances are all equal, and an alternative hypothesis that the error variances increase (or decrease) as the predicted values of the dependent variable increase. A large chi-square for both exports and imports (329, 293 respectively) and a high significance of the both test statistics (p=0,0000) indicate the presence of heteroskedasticity. This result is common in the gravity equation analysis, as the data sample usually consists of bilateral trade flows collected from multiple countries, which naturally gives ground to heteroskedasticity (Xiong & Chen, 2012, 3). In general, heteroskedasticity is less a concern as long as the model is correctly specified, because it does not undermine the consistency of estimates.

In order to deal with heteroskedasticity OLS and IV regressions with robust standard errors are used in this thesis. As it was shown by Silva &Tenreyro (2006, 641) PPML method is robust to the different patterns of heteroskedasticity because it estimates the dependent variable in levels and not in logarithms.

Another concern is the possible presence of multicollinearity. Multicollinearity occurs when the predictor variables in the regression are highly correlated with one another. When this happens, standard errors become inflated, making the coefficients unreliable. The obtained coefficients can be highly sensitive to the particular model specification. The addition or subtraction of specific

variables may considerably change results. Similarly, rescaling one or more variables (e.g. logged or linear form) may have a big effect on the coefficient estimates of other variables (Winship, 1999, 11).

According to the simple correlation between variables (Appendix 1), there might be a problem of multicollinearity, as there is a high correlation between logarithm of the product of real GDPs per capita (referred later in text as: GDPcap) and Partner institutions (0,835 for import and export). Similarly, high colinearity between the GDP per capita and institutions was observed by Babetskaia-Kukharchuk & Maurel (2004, 691) in their study of the influence of the institutions on Russian trade. It is usually considered that correlation between independent variables of more than 0,70 might be a problem and it requires further investigation.

Variance inflation factor (VIF) is the most commonly used method to check for multicollinearity. In the presence of multicollinearity standard errors, and hence the variances, of the estimated coefficients are inflated. The variance inflation factor (VIF) is the factor by which the variance is inflated:

$$VIF_i = \frac{1}{1-R_i^2} \tag{19}$$

Where R_i^2 is the R-squared obtained by regressing the *i*th predictor on the remaining predictors. The VIF exists for each of the i predictors in a multiple regression model. A VIF of 1 signifies no correlation among the predictor and the remaining predictor variables, and hence not inflated variance. The opinions of the researches differ on how high the VIF has to be to signify a problem. The general rule of thumb is that VIFs exceeding 4 require closer attention, while VIFs exceeding 10 are the evidence of serious multicollinearity. Although, some researches as Allison (2012) suggest to pay attention to the VIF greater than 2.50, which corresponds to an R-squared of 0,60 with the other variables. The obtained results from the VIF estimation are presented in Table 5.

Table 1: Collinearity of the regressors

		Log Distance	Log pr. real GDP	Log pr. real per capita GDP	Com. border	Com. language	Institutions Russia	Institutions Partner	Mean VIF
Import	VIF	1.73	1.67	4.48	1.77	1.77	1.02	3.83	2.32
	1/VIF	0.58	0.60	0.22	0.57	0.57	0.98	0.26	
Export	VIF	1.63	1.56	3.70	1.62	1.62	1.02	3.38	2.08
	1/VIF	0.61	0.64	0.27	0.62	0.62	0.98	0.30	

Table 5 provides no evidence of serious multicollinearity, because all the VIFs are much lower than 10. Although, the GDPcap variable is still a concern, especially for import, as the VIF of this variable is the highest and it highly correlates with the variable of Partner institutions.

Several measures can be employed to tackle the problem of multicollinearity such as collecting the additional data or new data, respecifying the model or dropping a problem variable (Grewal et al., 2004, 521). In this thesis, the Author follows Babetskaia-Kukharchuk & Maurel (2004) and provides estimates both with and without the GDPcap variable. The opinions whether the GDP per capita should be included in the gravity equation differ. Bergstrand (1989) argues that the GDP per capita should be included in the equation as it measures the influence of the level of development on trade, whereas Anderson & Van Wincoop (2003) present estimates without the GDP per capita. In this thesis, when the variable GDPcap is dropped from the OLS regression, the VIFs for all the variables in both equations take the value below 2.

Estimations of the gravity model, using the Ordinary Least Squares (OLS) method, the Instrumental Variable (IV) method, both corrected for heteroskedasticity, and Poisson Pseudo Maximum Likelihood (PPML) method, including and excluding the GDPcap variable, are reported in Table 6. The results for the first stage of the IV estimates are presented in Appendix 2.

Table 2: Gravity model estimates

Export						
	OLS (GDPpercap)	***OLS***	***IV (GDPpercap)***	***IV***	***PPML (GDPpercap)***	***PPML***
Log Distance	-1,960*** (0,08)	-1,990*** (0,08)	-1,964*** (0,26)	-1,853*** (0,11)	-1,728*** (0,10)	-1,821*** (0,10)
Log pr. real GDP	1,102*** (0,04)	1,129*** (0,03)	1,047*** (0,08)	0,964*** (0,05)	0,878*** (0,03)	0,911*** (0,03)
Log pr. real per capita GDP	0,199** (0,07)		-3,820* (1,53)		0,265*** (0,06)	
Common border	0,650** (0,22)	0,606** (0,21)	-0,619 (0,66)	0,491 (0,26)	0,220 (0,14)	0,089 (0,13)
Common language	1,350*** (0,23)	1,340*** (0,22)	2,811** (0,91)	1,727*** (0,28)	0,466* (0,19)	0,513** (0,19)
Institutions Russia	0,743*** (0,15)	0,819*** (0,15)	8,915*** (2,45)	3,292*** (0,36)	0,962*** (0,16)	0,980*** (0,16)
Institutions Partner	-0,217*** (0,05)	-0,093** (0,04)	3,772* (1,53)	0,290*** (0,08)	-0,276*** (0,06)	-0,142** (0,05)
Constant	2,862* (1,25)	4,895*** (1,10)	19,855* (10,12)	-3,780* (1,71)	6,036*** (1,38)	9,777*** (1,14)
Obs.	1586	1586	1471	1471	1754	1754
R-squared	0,697	0,695	-0,883	0,626	0,506	0,482
RESET p-values	0,2203	0,0749	0,0000	0,0000	0,6924	0,8861
Linktest p-values	0,156	0,033	0,000	0,597	0,722	0,893
Import						
	OLS	***OLS***	***IV***	***IV***	***PPML***	***PPML***

	(GDPpercap)		***(GDPpercap)***		***(GDPpercap)***	
Log Distance	-0,975*** (0,11)	-0,970*** (0,10)	-1,324*** (0,23)	-0,660*** (0,14)	-1,004*** (0,10)	-1,152*** (0,10)
Log pr. real GDP	1,418*** (0,04)	1,411*** (0,04)	1,274*** (0,07)	1,187*** (0,06)	0,922*** (0,03)	0,958*** (0,03)
Log pr. real per capita GDP	-0,035 (0,09)		3,493*** (0,95)		0,346*** (0,06)	
Common border	1,481*** (0,21)	1,489*** (0,21)	2,088*** (0,42)	1,614*** (0,23)	1,185*** (0,12)	0,966*** (0,10)
Common language	2,413*** (0,26)	2,404*** (0,26)	-0,079 (0,87)	2,819*** (0,33)	1,089*** (0,17)	1,155*** (0,18)
Institutions Russia	0,426* (0,21)	0,416* (0,21)	-2,906 (1,53)	2,312*** (0,41)	0,662*** (0,12)	0,713*** (0,13)
Institutions Partner	0,007 (0,08)	-0,015 (0,05)	-3,465*** (0,94)	0,401*** (0,11)	-0,330*** (0,04)	-0,150*** (0,03)
Constant	-10,256*** (1,78)	-10,580*** (1,45)	-31,713*** (5,57)	-17,279 *** (2,04)	-2,024 (1,34)	3,135** (1,04)
Obs.	1226	1226	1187	1187	1754	1754
R-squared	0,663	0,663	-0,034	0,614	0,775	0,733
RESET p-values	0,0000	0,0000	0,0006	0,0000	0,0696	0,5094
Linktest p-values	0,000	0,000	0,000	0,357	0,117	0,552

Standard errors in parentheses
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

According to Table 6 the gravity model is correctly specified as most of the results are consistent across the models: the estimated coefficients are statistically significant and the signs are in line with the model predictions. The results across all the estimation methods are in line with the basic theoretical gravity model: trade flows are predicted based on the distance within two units as well as their respective economic dimensions, where distance is measured in terms of the geographical distance between two countries and economic dimensions are presented by the economic size of the countries (GDP). The obtained R-squared differs between the models but it is high enough to conclude that the regression line fits the observations relatively well (not considering the special case of the IV method with the GDPcap variable, that will be discussed in more detail later in this chapter). The Author believes that the difference in the R-squared between export and import can be explained by the different amount of zeros in the data (with import having more zero observations than export).

The findings in the Table 6 give a broad confirmation to the conclusion made by Silva & Tenreyro (2006), that estimating the gravity model with the PPML method tends to produce lower (absolute) estimated coefficients of distance and other trade costs parameters (such as common border and common language).

The coefficients of the product of real GDPs are positive and highly significant in all estimations. These make good economic sense as, according to the gravity theory, the amount of bilateral trade is promoted by the economic size (GDP) of the countries and larger countries tend to trade more.

The estimated coefficient for the logarithm of distance implies that 1 percentage point increase in distance decreases export by 1,96 percentage points and import by 0,98 percentage points (see Column 1, Table 6). Distance has a larger impact on Russian exports than on imports. The obtained results for the distance coefficients are higher, but still in a comparable range with the results obtained for Russian export, without taking into account institutional variables. Lissovolik & Lissovolik (2004, 30) observed the coefficient for the logarithm of distance of -1,22 (OLS for years 1995-2002), while in this thesis the coefficient is -1,96.

Sharing a border has a positive effect on trade under OLS, but no significant effect under the PPML and the IV methods in the case of export. This finding contradicts the observations by Silva & Tenreyro (2006, 651), where they found that common border is not significant under OLS, but is significant under PPML.

Sharing a common language has similar positive effects under OLS and PPML, but PPML produces lower estimations than OLS. Russian trade with countries that are able to speak the Russian language is larger than with countries not speaking Russian, according to OLS 286% (for export) and 1017% (for import), and according to PPML 60% (for export) and 197% (for import)[4], for the specification with the GDPcap variable. The Author believes that so big numbers can be explained, firstly, by strong ties between Russia and former USSR countries that are still present after the collapse of the USSR. Secondly, very low percentage of the Russian population knows a foreign language. According to the calculations done by the Author, based on the All-Russia population census of 2010 statistics, the percentage of the Russian population, knowing the English language is 5 %, while up to 99% of the population knows Russian language.

An interesting finding was found that when controlling for the GDPs per capita, in some cases the coefficient for this variable becomes negative. Following a discussion by Frankel et al. (1997, 60-61) and Sleptsova (2007), two competing hypotheses can be taken into consideration, when interpreting the negative sign of this variable. According to the Heckscher-Ohlin theory of trade the sign of the coefficient should be positive, denoting a positive sign on the difference between per capita incomes, as countries with different endowments (capital/labour ratios, proxied by GDP per capita) will tend to trade more with each other. To the contrary, another perspective was suggested by Linder (1961). It states that countries with similar per capita incomes will produce similar, but differentiated, products and will have similar preferences. With bigger difference between GDPs per capita, countries will trade less with each other. Thus, the negative sign might reflect that the country trades more with countries of similar level of income. Although in the case of this thesis,

4 ($\approx \exp(b_i) - 1$), where b_i is the estimated coefficient

the explanation for the negative sign of the GDPcap variable might be the one suggested by Yu (2010, 296), who observed similar effect for China. When the variables for institutional quality are not controlled for, the bias appears in the gravity equation and part of the positive effect of institutions on trade is misattributed to per capita income.

The results of the gravity equation specified with the GDPcap variable and without differ significantly, especially in the IV method. With the inclusion of the variable, the R-squared for the IV becomes negative in export and import, and the coefficients for institutions in the case of import have a negative sign. Whereas in the cases when the variable is dropped, the R-squared is considerably high and institutional coefficients are positive in both export and import. The standard formula for calculating the R-squared is: $R^2 = 1 - SSR/SST$, where SSR is the sum of squared IV residuals, and SST is the total sum of squares. Unlike the case of OLS, the R-squared from IV estimation can be negative as SSR for IV can be larger than SST.

The major difference (from negative to positive) in the coefficients in the specifications with the GDPcap variable and without in the import equation may be the result of the multicollinearity problem. As it was discussed above the VIF of 4,48 of the GDPcap variable in the import case was a concern, as it was the highest VIF among the estimates. This finding goes along with the statement done by Wooldridge (2009, 523) that multicollinearity in the case of the IV method can be more serious compared to the OLS method due to the fact that the variance of a coefficient in the IV estimation is larger than that of the OLS.

When comparing the results of the OLS and the PPML methods with specification with the product of the GDPs per capita and without, we can see that the exclusion of this variable does not influence much the quality of the estimates. By comparing the R-squared across models we can see that in the case of OLS the R-squared does not change when the GDPcap variable is excluded. In the case of PPML it decreases, but the decrease is not high.

When a variable is excluded from the estimation, there is a threat that the model will be misspecified. To check for the misspecification of the model the Ramsey RESET specification test can be used. More detailed discussion on this test will be provided in Chapter 7.3.2. For the case of export, according to the RESET test of the OLS, both equations with and without the variable are specified correctly, although the specification without the variable gets a lower result of the p-value in the test (0,0749 compared to 0,2203 with the variable). The reason for this might be that in export the GDPcap variable is significant, which means that dropping it out will deteriorate the model. In the case of import, the RESET test shows that both OLS models are misspecified. In PPML

estimations for export and import the RESET test shows a significant improvement of the model, when the variable GDPcap is excluded, despite it is statistically significant.

To sum up, a considerable difference can be observed between the estimations with the GDPcap variable and without. It seems that this variable is more a concern in the case of import, because of the higher collinearity with the variable of Partner institutions. In order to be able to compare the models the same variables should be included. As it was discussed above, the exclusion of the variable does not bias much the OLS estimates and in case of PPML and IV estimates it leads to model improvement.

7.2 Influence of institutions on trade

As one of the main focuses of this thesis is the influence of the institutions on trade, this chapter discusses the impact of Partner and Russian institutions on Russian trade in more detail. According to the results presented in the Table 6, the coefficients of institutions differ significantly within various estimation methods.

The important observation, obtained from the Table 6, is that the institutional variables are highly statistically significant in most of the estimations. That supports the statement by Anderson and Marcouiller (2002), that it is essential to include institutional variables in the gravity equation in order to obtain unbiased results.

Another important result for this thesis is that the coefficients for Russian institutions are always positive[5], which signifies that the improvement of institutional quality implies a potential for trade increase. Hence, a one-scale increase in the Russian institutional quality leads to around a 96 percentage point increase in export and 66 percentage point increase in import in case of PPML.

As it was discussed in Chapter 3, it is expected that the quality of Russian institutions will be improved due to the WTO membership. The improvement in the quality of institutions will increase trade, as it was shown above. In order to assess the potential trade increase from the improvement of the institutions, actual trade of Russia should be compared to a counterfactual situation in which Russian institutions had achieved the quality level of the EU institutions. The EU institutions are a good benchmark as the average quality of the EU institutions is considerably high. In the year 2011 Russian institutions scored 3,97 and the average score of the EU institutions was 7,35. The increase of the Institutional variable would yield to increase in trade, as the Institutional variable is positively related to the trade flow:

5 Except for the case of the IV method with GDPcap in import, where the coefficient is not significant

$$X = \alpha_{Rus}(Institutions^{EU} - Institutions^{Rus}) \quad (20)$$

from which it follows that

$$e^X - 1 = e^{\alpha_{Rus}(Institutions^{EU} - Institutions^{Rus})} - 1 \quad (21)$$

Where X is the Russian export or import, $\text{Institutions}^{\text{EU}}$ and $\text{Institutions}^{\text{Rus}}$ are institutional coefficients for the EU and Russia, α_{Rus} is the obtained coefficient for Russian institutions from Table 6 and the term $e^X - 1$ represents the potential increase in Russian trade implied by an improvement of the quality of Russian institutions to the EU standards (Babetskaia-Kukharchuk & Maurel, 2004). Therefore, in the OLS estimations export will increase by 32% and import by 15%, and by 204% and 118% respectively in the IV estimation. In the PPML estimation, export has a potential to increase up to 39%[6] and import up to 27%. It can be seen that the export is due to increase more than import according to both estimations. It is worth to mention, that this result contradicts the theory, discussed earlier in Chapter 4 that stated that institutions of the importer country matter more than the institutions of the exporter country. For the case of Russia it can be seen that Russian institutions matter more for the Russian export than import, as the export is due to increase more than import if the quality of the Russian institutions improved. This situation is beneficial for Russia as it is the net exporter country, with its total exports higher than its total imports (discussed previously in Chapter 6).

The coefficient of the Partner institutions is negative in the PPML estimations and the OLS estimations in the case of export, which means that the better the quality of the institutions of Russian partners, the less Russia will be trading with them. This may be because institutional quality is not exogenously given and is affected by trade. Similar observation of significant difference in the results between an empirical method controlling for endogeneity, on the one hand, and PPML and OLS estimations, on the other, was made by Berger et al. (2012). Once the endogeneity issue is controlled in this thesis, with the help of the IV method, both institutional variables, for Russia and for Partner, become highly statistically significant and influence positively trade. The coefficients for the institutional quality are much smaller when endogeneity is not controlled compared to when it is accounted for, which is similar to the result, obtained by Yu (2008, 20). Without controlling for endogeneity, the positive effects of institutions on trade are underestimated because they are undercut by the reverse negative effects of trade on institutions. It is worth to notice, that during the current crisis and the slowdown of the world economy Partner

6 ≈EXP(0.97*(0.735-0.397))-1

institutions may play a negative role for the Russian trade. Thus, according to Merkulov (2012), the anti-crisis measures of Russian trade partners may hinder Russian export. Those measures require close monitoring and taking appropriate actions by the Russian authorities to protect domestic producers.

Another possible reason why the coefficient of Partner institutions varies significantly across different estimation methods is the little variation over time of this variable. As it was discussed in Chapter 6.2, the variable with little variation can produce coefficients with high variation over the estimation methods. Therefore, this might be the reason for the results in Table 6: in the import case the coefficient for Partner institutions is insignificant in the OLS method and very significant in the IV and PPML methods; in the case of export the coefficient is negative in the OLS and PPML methods, but positive in the IV method. Similar major changes in the coefficients for the variables with little variation over time were observed by Baccaro & Rei (2007). As the institutional variables were obtained by taking the arithmetic mean of three institutional indexes, the problem of little time variation of the variables could have gotten worse due to averaging. Therefore, each index was included in the first stage IV estimation one at a time to check if one of those variables produces better results. As it can be seen from Appendix 3, the results of the IV estimation with separate institutional variables are close to those with the average of those variables. Therefore, taking the arithmetic mean of three institutional variables in this thesis is justified.

To sum up, the institutions play a significant role in determining Russian trade flows. Russian institutions are always highly significant in the case of export, while in the case of import they obtain higher significance level in PPML and IV estimation without the GDPcap variable. Partner institutions obtain a positive and significant coefficient only when the endogeneity is controlled for, which means that there is a strong reverse causality between Partner institutions and Russian trade.

7.3 **Additional tests**

This chapter discusses post estimation tests that are performed in order to check for the robustness of the results. First, the analysis of the IV method is presented, that consists of checking for the quality of the chosen instrumental variables and comparison of the OLS and IV methods. Second, all the three methods (OLS, IV and PPML) are compared and the criteria of choosing the most appropriate model are discussed.

7.3.1 Instrumental variable method

As it was discussed in the Chapter 7.1 the results of the IV method improve with the exclusion of the GDPcap variable. That is why in this chapter only the specification of the model without this variable will be considered.

The results of the IV method highly depend on the quality of the chosen instrumental variables. Therefore, it is important to test how the instrumental variables fulfill the necessary conditions of good instruments: the instrument should correlate with the variable and not correlate with the variable's error term. To fully justify the validity of the instrumental variables, some additional tests should be reported.

Additional tests are started with checking whether the instrumented variables for Russian and Partner institutions are really endogenous. If the null hypothesis of the Durbin-Wu-Hausman test is rejected the variables are endogenous (Cameron & Trivedi, 2009, 183). The null hypothesis is rejected at a highly significance level (p=0,0000, and a robust regression F statistic 67 for export and 24 for import). Apart from endogeneity, this test is sometimes used to check whether the OLS approach is more efficient than the IV. As the variables proved to be endogenous, we can make a conclusion that the IV approach might be more efficient. In order to compare the IV and the OLS methods further, the Hausman specification test is performed. The test has a chi-squared distribution and the degrees of freedom are usually equal to the number of instruments. The test compares the differences between the OLS and the IV coefficients. According to the test, the IV estimator b will be consistent under both the null hypothesis and the alternative. While the OLS estimator B will be consistent and unbiased, and more efficient than the IV estimator under the null hypothesis, but it will be inconsistent if the null hypothesis is false. The null hypothesis is rejected in both export and import, signifying that IV estimator is more efficient than the OLS estimator. Furthermore, according to the LINK test, which will be discussed in Chapter 7.3.2, the IV method (without the GDPcap variable) performs better than the OLS method (due to higher p-values).

Next, several tests are performed to see whether the instruments are correctly chosen for the estimation. Firstly, the simple correlation between the instrumented variables (Russian and Partner institutions) and the instruments (country's infant mortality rate, ELF variable) is checked. It is found that a country's infant mortality rate is highly correlated with its institutions (-0,6964 for Partner countries and -0,5549 for Russia), as well as ELF variable highly correlates with the quality of Partner institutions (-0,3625). That signifies that the instruments pass one of the tests of good instruments.

Secondly, the possibility of weak instruments is taken into consideration. In order to check for weak instruments, the Anderson-Rubin Wald test of joint significance of endogenous regressors is used after the first stage of the IV estimates (The results of the first stage estimates are presented in Appendix 2). The null hypothesis of the test is the joint insignificance of the endogenous regressors. This hypothesis is rejected with a highly significant p-value (and the value of F statistic 40,45 for exports and 15,78 for imports). That means that the joint effect of the instrumental variables is significant in both cases.

Finally, in order to justify the validity of the IV method, several post estimation tests are discussed. The tests are done with the help of the ivreg2 command that allows performing several important tests[7]. This command is an alternative to the Stata's official ivregress command.

Firstly, the Underidentification test is performed. The test checks whether the IV equation is identified. The excluded instruments should be relevant and they should correlate with the endogenous regressors. The test uses Kleibergen-Paap rk LM statistic and tests the rank of a matrix. The null hypothesis is that the equation is underidentified under t[8]. The test statistic is distributed as chi-squared with degrees of freedom equaling (L1-K1+1). In this thesis the null hypothesis is rejected in the export and import cases, which signifies that the model is identified (the matrix is full column rank).

Secondly, to test for Overidentification, the Sargan-Hansen test is performed. The joint null hypothesis of the test is that the instruments are valid instruments (uncorrelated with the error term, and that the excluded instruments are correctly excluded from the estimated equation). The test statistic is distributed as chi-squared in the number of (L-K) overidentifying restrictions. The test does not reject the null hypothesis with a high significance level of 77% for export and 28% for import. Hence, the instruments used in this thesis are valid instruments.

In conclusion, the instruments for the IV method are correctly chosen, so that the IV estimations provide feasible results. According to all the test results for the import, the IV method is more efficient than the OLS method. For the export case, only OLS passes the RESET test, but the results of the LINK test with a specification without the GDPcap variable signify that the IV method is better due to the higher p-values. As the Hausman test suggests that the IV method is preferable, we can conclude that this method outperforms the OLS method in both export and import cases.

7 See: BaumC., Schaffer M., Stillman S. (2010) ivreg2: Stata module for extended instrumental variables/2SLS, GMM and AC/HAC, LIML and k-class regression. http://ideas.repec.org/c/boc/bocode/s425401.html

8 The matrix of reduced form coefficients on the L1 excluded instruments has rank=K1-1 where K1 equals the number of endogenous regressors.

7.3.2 Comparison of empirical models

In order to compare different empirical methods and decide which method provides proper model specification the heteroskedasticity-robust Regression Equation Specification Error Test (RESET) (Ramsey, 1969) is used. This test was suggested by Silva & Tenreyro (2006) in order to check the adequacy of the estimation results provided by different empirical models. The RESET test is popular among the researchers using PPML, as it has been used in many recent economics papers, i. e. McAuslanda & Millimet (2012), Thorbeckea & Kato (2012), Matos & Faustino (2012).

The test checks for the correct specification of the conditional expectation. It is performed by adding and checking for the significance of an additional regressor, constructed as $(x'b)^2$, where b is the vector of estimated parameters. The null hypothesis of the test is that the model is specified correctly and an additional regressor does not improve the model. Therefore, the coefficient of the added additional regressor equals zero. If the RESET test p-value is insignificant, the test provides no evidence of misspecification. The p-values, obtained for different estimation methods, are reported at the bottom of Table 6. In the export case, considering both specifications with and without the GDPcap variable, the p-values are insignificant for OLS and PPML and significant for the IV method. Therefore, the model is correctly specified only with OLS and PPML methods. Moreover, the obtained p-values are higher for PPML (0,6924 and 0,8861 compared to 0,2203 and 0,0749 in OLS). This means that for PPML we cannot reject the hypothesis that the model is correctly specified at any significance level below 69% (with the GDPcap variable) and 89% (without the variable). For the case of import, the results differ from those obtained for the export case. Only PPML passes the RESET test and provides no evidence of misspecification of the gravity equations estimated using the PPML.

In order to choose the right estimation method, it is suggested by several authors such as Steinbach (2012), Martínez-Zarzoso & Márquez-Ramos (2007), Olper &Raimondi (2008) to perform the LINK test to detect model specification errors, as an alternative to the RESET test. According to the test, if the model is specified correctly, it should not be possible to find any additional independent variable that will be significant. Two new variables are constructed in the test, a prediction variable (hat) and a variable of the square prediction (hatsq). The new variables are used as predictors to refit the model. In case the model is specified correctly, the prediction squared should not have explanatory power (Statabase reference manual). The p-values for the prediction squared are reported in Table 6. For Russian import, the results of the test showed that the variable square prediction was significant for all the OLS results and the IV (with the GDPcap variable), indicating a misspecification of those models. For the export, the test showed that the model was specified

incorrectly in the cases of OLS (without the GDPcap variable) and IV (with the GDPcap variable). For both export and import, the PPML method (without the GDPcap variable) passed the LINK test with the high p-values (0,893 and 0,552 for export and import respectively).

To sum up, two tests have been used to check for the robustness of the results. The OLS for exports passed both of the tests, whereas for imports strong evidence of severe misspecification was found. The IV method was not specified correctly when the GDPcap variable was included. IV method without this variable only passed the LINK test. The PPML method passed all the tests and did not show signs of misspecification. It is worth to notice, that according to the results of the two tests, the gravity model is better, when the variable GDPcap is dropped. This result is possibly due to the high correlation between this variable and the Partner institutions. When comparing the three estimation methods, a conclusion can be made that the OLS and the IV methods are outperformed by the PPML method. The reason for this is that the PPML method provides more accurate estimation results when zero trade flows represent a large fraction of the data, as it was stated by Silva & Tenreyro (2006).

Conclusions

The aim of this thesis has been to study the impact of the WTO on Russian export and import through the improvement of the quality of Russian institutions; in addition the influence of Partner institutions on the Russian trade was assessed. Despite the importance of the influence of Russian accession to the WTO on its trade, little research has been done on this topic, especially through the perspective of improved institutional quality.

The theoretical part of this thesis concentrated on explaining the mechanisms of the influence of the WTO on trade. First, the general impact of the WTO on trade was discussed. It was noticed that the opinions of the researchers diverse whether the accession to the WTO influences trade or not. It was concluded that one of the reasons for a diversity of the research results was that the institutional quality was not taken into consideration. Thus, the aim of this thesis can be justified. Second, the influence of the WTO on institutions was considered with special attention paid to the case of Russia. This part showed that the WTO plays a big role in the improvement of institutional quality of the country by obliging the countries to make commitments during the accession process. But, despite the WTO encouraging and helping the improvements, the results depend on the willingness of the authorities of the country to introduce changes, which is especially true in the case of Russia as it is a big country. Third, the impact of the institutions on trade was assessed. The theoretical model was presented in order to show that better quality institutions encouraged higher level of trade, due to the fact that the traders preferred higher levels of contract enforcement as it increased the probability to be matched at the market and sell their products. The review of the empirical literature also supported the evidence that institutional improvement had a positive impact on trade.

The empirical findings of this thesis supported the earlier suggestions that institutions should be considered when estimating the trade flows. The gravity equation was estimated with a simple ordinary least square (OLS) method, Poisson Pseudo-Maximum Likelihood (PPML) method, to account for the fact that the sample included a large number of zero observations, and Instrumental Variable (IV) method to consider possible endogeneity of institutional variables. The coefficient of the variable of the major interest, the quality of Russian institutions, proved to be highly significant in most of the cases and always had a positive impact on trade. Russian export has a potential to increase up to 39% and import up to 27% in the PPML estimates if Russian institutions obtained the quality of the European institutions. As for the Partner institutions, they proved to influence positively Russian trade only when endogeneity was accounted for.

The results of the econometric methods used in this thesis were checked for robustness with two tests (RESET test and LINK test). The results of the tests proved that the PPML method outperformed the OLS and the IV methods, confirming the previous findings that the PPML method was more appropriate in the case of the large number of zero trade observations in the data. But it is important to address as well the issue of endogeneity of institutional variables, as the IV method produced different results and turned out to be more efficient than the OLS method.

As this study proved positive impact of Russian institutions on Russian trade, the possible idea for the future research can be performing same estimations with the data on the development of Russian institutions after accession to the WTO, to see how close the predictions of this research were to the real situation.

In conclusion, it was possible to perceive quite precisely the impact of the WTO accession on Russian trade through the institutions. The obligations that Russia is due to fulfill due to its accession to the WTO will help to improve the quality of Russian institutions, which will in turn increase its trade. But Russian policymakers should understand that the WTO is not a remedy to all the institutional problems that are present nowadays in Russia and the positive effects from the membership in the WTO can be explored only with the willingness of the Russia authorities to implement the WTO rules and recommendations in practice.

List of references

Aaronson S., Abouharb M. (2011) *Does the WTO help member states clean up?* NCCR working paper No. 201149.

Allee T., Scalera J. (2012) The Divergent Effects of Joining International Organizations: Trade Gains and the Rigors of WTO Accession. *International Organization* 66 (2), 243-276

Allison P. (2012) When Can You Safely Ignore Multicollinearity? *Statistical Horizons*. Available at: http://www.statisticalhorizons.com/multicollinearity, 14.01.2013

All-Russia population census of 2010. Ethnic composition, Language skills and citizenship: knowledge of languages by the citizens of Russian Federation. Available at: http://www.gks.ru/free_doc/new_site/perepis2010/croc/Documents/Vol4/pub-04-05.pdf, 18.01.2013

Anderson J., Marcouiller D. (1999) *Trade, Insecurity, and Home Bias: An Empirical Investigation.* National Bureau of Economic Research, Inc. NBER Working Paper No. 7000

Anderson J., Marcouiller D. (2002) Insecurity and the pattern of trade: an empirical investigation. *The Review of Economics and Statistics* 84 (2), 342–352

Anderson J., Wincoop E. (2003) Gravity with gravitas: a solution to the border puzzle. *The American Economic Review* 93 (1), 170-192

Anderson J. (1979) A Theoretical Foundation for the Gravity Equation. *American Economic Review* 69 (1), 106-116

Anderson J., Young L. (2000 a) *Trade implies law: The power of the weak.* NBER Working paper No. 7702, Available at: http://www.nbiasber.org/papers/w7702.pdf, 17.09.2012

Anderson J., Young L. (2000 b) *Trade and Contract Enforcement*. Tufts university, department of economics Working paper. Available at: http://ase.tufts.edu/econ/papers/jim_anderson.pdf, 14.09.2012

Anderson, J., Young L. (2006) Trade and Contract Enforcement. *The B.E. Journal of Economic Analysis & Policy*, Berkeley Electronic Press. Available at: http://www.bepress.com/cgi/viewcontent.cgi?article=1574&context=bejeap, 14.09.2012

Anderson, James E (2011) The gravity model. *Annual review of economics* (3), 133-160

Armijo L. (2007) The BRICS countries as analytical category: mirage or insight? *Asian perspective* 31 (4), 7-42

Arvis, J., Shepherd B. (2011) *The Poisson quasi-maximum likelihood estimator: A solution to the adding up problem in gravity models*. MPRA Paper No. 34334

Babecká Kucharčuková O., Babecký J., Raiser M. (2012) Gravity Approach for Modelling International Trade in South-Eastern Europe and the Commonwealth of Independent States: The Role of Geography, Policy and Institutions. *Open economies review* 23 (2), 277–301

Babecká Kucharčuková O., Maurel M. (2004) Russia's accession to the WTO: the potential for trade increase. *Journal of Comparative Economics* (32), 680–699

Baccaro L., Rei D. (2007) Institutional Determinants of Unemployment in OECD Countries: Does the Deregulatory View Hold Water? *International Organization* 61 (3), 527-569

Baldwin R. Taglioni D. (2006) *Gravity for dummies and dummies for gravity equation*. National Bureau of Economic Research Working Paper No. 12516

Basu S. (2008) *Does WTO accession affect domestic economic policies and institutions?* HEI Working Paper No. 03/2008

BaumC., Schaffer M., Stillman S. (2010) *ivreg2: Stata module for extended instrumental variables/2SLS, GMM and AC/HAC, LIML and k-class regression*. Available at: http://ideas.repec.org/c/boc/bocode/s425401.html, 28.01.2013

Beck N., Katz J. (2001) Throwing out the baby with the bath water: a comment on Green, Kim and Yoon. *International Organization* 55(2), 487-495

Belke A., Bordon I., Melnykovska I., Schweickert R. (2009) *Prospective NATO or EU membership and institutional change in transition countries.* Institute for the Study of Labor Discussion paper No. 4483

Belton C (2012) Russia joins WTO after 19 years of talks. *The Financial Times*. Available at: http://www.ft.com/intl/cms/s/0/113bd1be-ec6c-11e1-81f4 00144feab49a.html#axzz29f3w2zqT, 13.10.2012

Berger A., Busse M., Nunnenkamp P., Roy M. (2012) Do trade and investment agreements lead to more FDI? Accounting for key provisions inside the black box. *International Economics and Economic Policy*. Available at: http://link.springer.com/article/10.1007/s10368-012-0207-6/fulltext.html, 2.02.2013

Bergstrand J. (1989). The generalized gravity equation, monopolistic competition, and the factorproportions theory in international trade. *Review of Economics and Statistics* 71 (1), 143–153

Berkowitz D., Moenius J., Pistor K. (2006) Trade, Law and Product Complexity. *The review of economics and statistics*, MIT Press (88), 363-373

Brock G. (2006) Russian regional external trading, 1997-2001. *Regional and sectoral economic studies*, 6 (1), 5-20

Büge M. (2010) *Institutions, uncertainty and the intensive margin of trade*. Sciences Po (GEM) & Princeton University Working paper. Available at: http://www.princeton.edu/~pcglobal/conferences/ptas/Buge_pta_paper.pdf, 23.12.2012

Bussière, M. and Schnatz, B. (2006). *Evaluating China's Integration in World Trade with a Gravity Model Based Benchmark*. European Central Bank Working Paper Series No. 693

Cameron A., Trivedi P. (2009) Microeconometrics Using Stata. *Stata Press*, Texas

Cattaneo O., Braga C. (2009) *Everything you always wanted to know about WTO accession (but were afraid to ask)*. The world bank Policy Research Working Paper No. 5116.

Central Intelligence Agency a, field listing: Languages. Available at: https://www.cia.gov/library/publications/the-world-factbook/fields/2098.html#rs, 15.11.2012

Central Intelligence Agency b, field listing: Russia. Available at: https://www.cia.gov/library/publications/the-world-factbook/geos/rs.html, 15.11.2012

CEPII. The CEPII Gravity Dataset. Available at: http://www.cepii.fr/anglaisgraph/bdd/gravity.htm, 10.11.2012

Chaney, T. (2008) Distorted Gravity: The Intensive and Extensive Margins of International Trade. *American Economic Review* 98 (4), 1707-1721

Chang P., Lee M. (2011) The WTO trade effect. *Journal of International Economics* 85 (1), 53–71

Chow G. (2001) *The impact of joining WTO on China´s economic, legal and political institutions.* Princeton University Working paper No. NJ 08544

Ciuriak D., Lapham B., Wolfez R. (2011) *New-New Trade Policy*. Queen's Economics Department Working Paper No. 1263

Daude C., Stein E. (2007) The quality of institutions and foreign direct investment. *Economics and Politics* (19), 317–344

Davis K., Fisher A., Kingsbury B., Merry S. (2012) *Governance by indicators, global power through quantification and rankings*. Oxford University Press. Available at: http://www.iilj.org/documents/GovernancebyIndicators.pdf, 19.10.2012

Deardorff, A. (1998) Determinants of Bilateral Trade: Does Gravity Work in a Neoclassical World? The Regionalization of the World Economy. *University of Chicago Press*, USA

Dixit A. (2004) Lawlessness and economics, alternative models of governance. *Princeton University Press*, USA

Drabek Z., Bacchetta M. (2004) Tracing the effects of WTO accession on policy-making in sovereign states: preliminary lessons from the recent experience of Transition Countries. *The World Economy* 27 (7), 1083 – 1125

Eaton, J., Kortum, S. (2002) Technology, Geography, and Trade. *Econometrica* 70(5), 1741-1779

Egger P. (2002) An Econometric View on the Estimation of Gravity Models and the Calculation of Trade Potentials. *The World Economy* (25), 297-312

Egger P., Lassmann A. (2012) The language effect in international trade: A meta-analysis. *Economics Letters* 116 (2), 221–224

Eicher T., Henn C. (2011) In search of WTO trade effects: Preferential trade agreements promote trade strongly, but unevenly. *Journal of International Economics* 83 (2), 137–153

Evenett S., Keller W. (2002) On theories explaining the success of the gravity equation. *Journal of Political Economy* (110), 281-316

Fally T. (2012) *Structural gravity and fixed effects*. University of Colorado-Boulder Working paper. Available at: http://spot.colorado.edu/~fally/Gravity_PPML.pdf, 21.01.2013

Faruq H. (2011) How institutions affect export quality. *Economic Systems* (35), 586–606

Fatica S. (2010) *Taxation and the quality of institutions: asymmetric effects on FDI*. MPRA Paper No. 24179.

Feenstra R. (2003) Advanced international trade: theory and evidence. *Princeton University Press*, USA

Feenstra R., Markusen J., Rose A. (2001) Using the gravity equation to differentiate among alternative theories of trade. *Canadian Journal of Economics* 34 (2), Pp. 430–447

Filippini C., Molini V. (2003) The determinants of East Asian trade flows: a gravity equation approach. *Journal of Asian Economics* 14 (5), 695–711

Frankel J., Wei S., Stein E. (1997) Regional trading blocs in the world economic system, *Institute for International Economics*, Washington, DC

Fratianni M., Marchionne F., Oh C. (2010) *The gravity equation in international economics and international business research: a note*. Indiana University, Kelley School of Business Working Paper No. 2010-08

Ghemawat P., Llano C., Requena F. (2010) Competitiveness and interregional as well as international trade: The case of Catalonia. *International Journal of Industrial Organization* (28), 415–422

Goldstein J., Rivers D., Tomz M. (2007) Institutions in International Relations: Understanding the Effects of the GATT and the WTO on World Trade. *International Organization* 61 (1), 37-67

Grewal R., Cote J., Baumgartner H. (2004) Multicollinearity and measurement error in structural equation models. *Marketing science* 23(4), 519–529

Hanson P., Cameron F. (2012) *The political and social developments in Russia in 2012 as a consequence of its new role on the global stage*. Study by Directorate-general for external policies of the union. Available at: http://www.europarl.europa.eu/RegData/etudes/etudes/afet/2012/433698/EXPO-AFET_ET%282012%29433698_EN.pdf, 13.01.2013

Hoekman B., Roy J. (2000) Benefiting from WTO Accession and Membership, in Hoekman, B. and J. Zarrouk (eds.), Catching Up with the Competition, *The University of Michigan Press*, USA

Hornok C. (2012) *Gravity or Dummies? The Limits of Identification in Gravity Estimations*. Central European University Working Paper. Available at: http://www.personal.ceu.hu/staff/repec/pdf/2012_11.pdf, 7.11.2012

Kaufmann D., Kraay A., Mastruzzi M. (2010) The Worldwide Governance Indicators, methodology and analytical issues. The World Bank Policy research working paper No. 5430

Kerr W. (2012) Taming the bear: the WTO after the accession of Russia. *The Estey Centre Journal of International Law and Trade Policy* 13 (2), 150-159

Khatibi A. (2008) *Kazakhstan's Accession to the WTO: A Quantitative Assessment*. ECIPE Working Paper No. 02/2008

Kolesnikov, Podkorytova O. (2011) *Russia's trade flows and WTO*. European University at St. Petersburg, Department of Economics, EUSP Deparment of Economics Working Paper No Ec-06/11

Lamy P. (2011) *Adoption of the decision on the accession of the Russian Federation. Director-General's Statement on Russia's Accession*. World Trade Organization document. Available at: www.wto.org/english/news_e/news11_e/acc_russ_lamy_e.doc, 14.09.2012

Lapin S. (2012) *Russia's WTO accession brings hope of reform*, International Bar Association. Available at: http://www.ibanet.org/Article/Detail.aspx?ArticleUid=D5F8BA6C-95A5-4EFD-8C03-F0D08094AD66, 18.09.2012
Levin M., Satarov G. (2000) Corruption and institutions in Russia. *European Journal of Political Economy* (16), 113–132

Li D, Wu C. (2004) GATT/WTO accession and productivity. Growth and Productivity in East Asia, *NBER-East Asia Seminar on Economics* (13), 109-148

Linders G., Groot H. (2006) *Estimation of the gravity equation in the presence of zero flows*. Tinbergen Institute Discussion Paper No. TI 2006-072/3

Lissovolik B., Lissovolik Y. (2006) *Russia and the WTO: The "Gravity" of Outsider Status*. IMF Staff Papers 53 (1) Available at: http://www.imf.org/External/Pubs/FT/staffp/2006/01/pdf/lissovol.pdf, 22.11.2012

Liu X. (2009) GATT/WTO Promotes Trade Strongly: Sample Selection and Model Specification. *Review of International Economics* 17 (3), 428–446

Lopez G. (2005) *The WTO's role in China's transition towards a market economy*. Working paper. Available at: http://www.academia.edu/1080333/The_WTOs_role_in_Chinas_transition_towards_a_market_economy, 21.11.2012

Ma Y., Qu B., Zhang Y. (2011) Institutional Barriers, Trade, and Product Complexity: Empirical Evidence at the Firm Level. *Review of International Economics*. Available at: http://works.bepress.com/yfzhang/6, 14.12.2012

Martin W., Pham C. (2008) *Estimating the Gravity Model When Zero Trade Flows are Frequent*. Economics Series, Deakin University, Faculty of Business and Law, School of Accounting, Economics and Finance. Available at: http://www.deakin.edu.au/buslaw/aef/workingpapers/papers/2008_03eco.pdf, 23.11.2012

Martínez-Zarzoso I., Márquez-Ramos L. (2007) *The effect of trade facilitation on sectoral trade*. Ibero America Institute for Economic Research Discussion paper No. 167

Matos P., Faustino H. (2012) Beta-convergence and sigma-convergence in corporate governance in Europe. *Economic Modelling* 29 (6), 2198‑2204

Maurel M. (2004) Current account constraint as a barrier to international trade: the evidence from the European enlargement process? *Economic Systems* (28), 301-317

Mauro P. (1995) Corruption and Growth. *Quarterly Journal of Economics* (110), 681-712

Mayer T., Zignano, S (2011). *Notes on CEPII's Distance Measures*. Available at: http://www.cepii.fr/anglaisgraph/workpap/pdf/2011/wp2011-25.pdf, 18.11.2012

McAusland C., Millimet D. (2012) Do national borders matter? Intranational trade, international trade, and the environment. *Journal of Environmental Economics and Management*. Available at: http://www.sciencedirect.com/science/article/pii/S0095069612000988

Melitz M., Ottaviano G. (2008) Market Size, Trade, and Productivity. *Review of Economic Studies* 75 (1), 295-316.

Merkulov K. (2012) Current state and prospects of development of Russian foreign trade: the post-crisis analysis. *Problems and prospects of the economy and management: international scientific conference (St. Petersburg, April 2012),* Russian Federation, 216-218

Michalopoulos C. (1999) WTO accession for countries in transition. World Bank, Document No. 1934, 1-24. Available at: http://elibrary.worldbank.org/docserver/download/1934.pdf?expires=1349942730&id=id&accname=guest&checksum=1620FC71E03D5AC981E146BA441DD8E7, 16.11.2012

National Anti-Corruption Strategy (Approved by Decree of the President of the Russian Federation №460 of 13 April 2010) Available at: http://eng.news.kremlin.ru/ref_notes/8, 17.09.2012

Nichols A. (2007) Causal inference with observational data. *Stata Journal* 7(4), 507-541

Nunn N. (2007) Relationship-specificity, incomplete contracts and the pattern of trade. *The Quarterly Journal of Economics, MIT Press* 122(2), 569-600

OECD. *Glossary of statistical terms*. Available at: http://stats.oecd.org/glossary, 27.01.2013

Olivero M., Yotov Y. (2012) Dynamic gravity: endogenous country size and asset accumulation. *Canadian Journal of Economics* 45 (1), 64–92

Olper A., Raimondi V. (2008) Elasticity of trade flow to trade barriers: a comparison among emerging estimation techniques. 2008 International Congress, August 26-29, 2008, Ghent, Belgium, *European Association of Agricultural Economists*.

Prakash A., Potoski M. (2006) Racing to the bottom? Trade, environmental governance, and ISO 14001. *American Journal of Political Science* 50 (2), 350–364

Qin U. (2003) WTO-Plus obligations and their implications for the World Trade Organization Legal System. *Journal of World Trade* 37(3), 483–522

Ramsey J. (1969) Tests for Specification Errors in Classical Linear Least-Squares Regression Analysis. *Journal of the Royal Statistical Society* 31 (2), 350-371

Ravenstein, E. (1889) The Laws of Migration. *Journal of the Royal Statistical Society* 52 (2), 241-305.

Rodrik D. (2000) *Trade Policy Reform as Institutional Reform*. Harvard University Working paper. Available at: http://idbdocs.iadb.org/wsdocs/getdocument.aspx?docnum=596078, 2.10.2012

Roeder P. (2001) *Ethnolinguistic Fractionalization (ELF) Indices, 1961 and 1985*. Available at: http//:weber.ucsd.edu\~proeder\elf.htm, 4.12.2012
Rose A. (2004) Do We Really Know That the WTO Increases Trade? *The American Economic Review* 94 (1), 98-114

Rose A. (2005) Which International Institutions Promote International Trade? *Review of International Economics* 13 (4), 682–698

Roy J. (2011) Is the WTO mystery really solved? *Economics Letters* 113 (2), 127–130

Rudolph S. (2010) *Computing Multilateral Resistances of Trading Countries*. Technische Universitat Dresden Working Paper. Available at: http://www.freit.org/WorkingPapers/Papers/TradePatterns/FREIT137.pdf, 21.01.2013

Ruiz J., Vilarrubia J. (2007) *The wise use of dummies in gravity models: export potentials in the Euromed region*. Banco de España Working paper No. 0720

Schuler P. (2003) *Institutions and the Changing Composition of International Trade in the Post-Socialist Transition*. Annual conference of the International Society of New Institutional Economics, Budapest Working paper. Available at: http://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=1&ved=0CCEQFjAA&url=http%3A%2F%2Fciteseerx.ist.psu.edu%2Fviewdoc%2Fdownload%3Fdoi%3D10.1.1.196.1246%26rep%3Drep1%26type%3Dpdf&ei=M3BtUPedJe334QSvlIGwBw&usg=AFQjCNFNMyDiWsM1i1bnvgHLMW4WO2B6zw&sig2=em2LLf6YK4QzKWbj8y4yFQ, 17.12.2012

Silva S., Tenreyro S. (2006) The Log of Gravity. *Review of Economics and Statistics* 88 (4), 641-658

Silva S., Tenreyro S. (2011) Further simulation evidence on the performance of the Poisson pseudo-maximum likelihood estimator. *Economics Letters* 112 (2), 220–222

Sleptsova E. (2007) *Gravity analysis of the determinants of Ukrainian exports: the role of regional trade arrangements*. Paper for presentation at the Sixth GEP Postgraduate Conference, 26-27, Centre for Russian and East European Studies, University of Birmingham. Available at: http://www.nottingham.ac.uk/gep/documents/conferences/2007/2007postgradconf/sleptsova-pgrconf07.pdf, 6.12.2012

Statabase reference manual release 11. *Stata Press*, StataCorp LP College Station, Texas

Steinbach S. (2012) Soviet heritage and post-Soviet economic integration— Ukrainian export trade patterns reviewed. *Journal of Eurasian studies* 4 (4), 96-113

Subramanian A., Wei S. (2007) The WTO promotes trade, strongly but unevenly. *Journal of International Economics* (72), 151–175

Tang M., Wei S. (2006) Does WTO Accession Raise Income? Working paper. Available at: http://www.cepr.org/meets/wkcn/2/2363/papers/Tang.pdf, 27.10.2012

Tarr D., Volochkova N. (2010) Foreign economic policy at crossroads. Chapter 10, Russia after the Global Economic Crisis, edited by Åslund A., Guriev S., Kuchins A., USA

Tenreyro S. (2007) On the trade impact of nominal exchange rate volatility. *Journal of Development Economics* (82), 485–508

The Heritage Foundation. Index of economic freedom. Available at: http://www.heritage.org/index/, 13.10.2012

The World Justice Project. What is the rule of law? Available at: http://worldjusticeproject.org/what-rule-law, 15.10.2012

Thorbecke W., Kato A. (2012) The effect of exchange rate changes on Japanese consumption exports. *Japan and the World Economy* 24 (1), 64‑71

Tinbergen, J. (1962). Shaping the World Economy: Suggestions for an International Economic Policy. *The Twentieth Century Fund*, New York

Tomz M., Goldstein J., Rivers D. (2007) Membership Has Its Privileges: The Impact of GATT on International Trade. American Economic Review 97 (5), 2005-2018

Transparency international, Corruption perception index 2011. Available at: http://cpi.transparency.org/cpi2011/results/, 21.10.2012

UNCTAD. Nominal and real GDP, total and per capita, annual, 1970-2011. Available at: http://unctadstat.unctad.org, 21.10.2012

United Nations a. Commodity Trade Statistics Database. Available at: http://comtrade.un.org/db/default.aspx, 24.09.2012

United Nations b. Department of Economic and Social Affairs, Population Division, World Population Prospects: The 2010 Revision, New York, 2011 Available at: http://data.un.org/Data.aspx?d=PopDiv&f=variableID%3a77, 25.09.2012

Vercuiel J. (2007) Russia and the WTO: On the Finishing Stretch. *Russie.Nei.Visions* (16), 1-23

Winship C. (1999) The perils of multicollinearity: A reassessment. Harvard University Working paper. Available at: http://courses.gov.harvard.edu/gov3009/fall99/10-20.pdf, 18.01.2013

Wooldridge J. (2009) Introductory econometrics: a modern approach. Fourth edition, *Cengage Learning*, USA
Wooldridge J. (2010) Econometric Analysis of Cross Section and Panel Data, Second Edition, *The MIT Press*, USA

World Bank a. Doing business 2012. Available at: www.doingbusiness.org, 20.09.2012

World Bank b. The Worldwide Governance Indicators (WGI) project. Available at: http://info.worldbank.org/governance/wgi/index.asp, 20.09.2012

World Bank c. World Development Indicators: Consumer Price Index. Available at: http://search.worldbank.org/data?qterm=CPI&language=EN, 20.09.2012

World Bank d. Doing Business 2012: Doing Business in a More Transparent World, Economy profile: Russian Federation. Available at: http://www.doingbusiness.org/~/media/giawb/doing%20business/documents/profiles/country/RUS.pdf, 20.09.2012

Worldwide governance indicators. Using the WGI data: Over time comparisons. Available at: http://info.worldbank.org/governance/wgi/resources., 20.09.2012

WTO a. Understanding the WTO. Available at: http://www.wto.org/english/thewto_e/whatis_e/who_we_are_e.htm, 15.09.2012

WTO b. Ten Benefits of the WTO (2008) Available at: http://www.wto.org/english/res_e/doload_e/10b_e.pdf, 15.09.2012

WTO c. Trade Policy Review Mechanism (TPRM) (1989), Annex 3 to the Marrakesh Agreement. Available at: http://www.wto.org/english/docs_e/legal_e/29-tprm.pdf, 15.09.2012

Xiong, B., Chen S. (2012) Estimating Gravity Equation Models in the Presence of Sample Selection and Heteroskedasticity. 2012 Annual Meeting, August 12-14, 2012, Seattle, Washington 124530, *Agricultural and Applied Economics Association*. Available at: http://ageconsearch.umn.edu/bitstream/124530/2/Xiong_Chen_0906.pdf, 5.01.2013

Yu M. (2008) *China's Foreign Trade, WTO Accession, and Institutional Quality*. China Center for Economic Research (CCER) Working paper. Available at: http://mjyu.ccer.edu.cn/research/cti.pdf, 3.10.2012

Yu M. (2010) Trade, democracy, and the gravity equation. *Journal of Development Economics* 91 (2), 289–300

Appendix

Appendix 1: Simple Correlation between Variables

Import

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
(1) Log Export	1,000							
(2) Log pr. real per capita GDP	0,425	1,000						
(3) Log Distance	-0,450	-0,195	1,000					
(4) Common language	0,216	-0,098	-0,459	1,000				
(5) Common border	0,330	0,077	-0,463	0,506	1,000			
(6) Institutions Partner	0,420	0,835	-0,246	-0,091	0,107	1,000		
(7) Institutions Russia	0,081	0,083	-0,000	-0,002	0,000	0,008	1,000	
(8) Log pr. real GDP	0,623	0,420	-0,314	-0,053	0,091	0,490	0,067	1,000

Export

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
(1) Log Export	1,000							
(2) Log pr. real per capita GDP	0,394	1,000						
(3) Log Distance	-0,550	-0,195	1,000					
(4) Common language	0,240	-0,098	-0,460	1,000				
(5) Common border	0,325	0,076	-0,462	0,510	1,000			
(6) Institutions Partner	0,367	0,835	-0,246	-0,091	0,106	1,000		
(7) Institutions Russia	0,100	0,083	-0,000	0,000	-0,000	0,008	1,000	
(8) Log pr. real GDP	0,641	0,420	-0,314	-0,051	0,090	0,490	0,067	1,000

Appendix 2: IV method First-stage regressions.

Institutions Russia	**Export**		**Import**	
	IV (GDPpercap)	***IV***	***IV (GDPpercap)***	***IV***
Log Distance	-0,0034 (0,013)	-0,0035 (0,013)	0,0024 (0,014)	0,0041 (0,014)
Log pr. real GDP	-0,0032 (0,004)	-0,0031 (0,004)	-0,0023 (0,005)	-0,0034 (0,005)
Log pr. real per capita GDP	0,0004 (0,008)		-0,0054 (0,010)	
Common border	-0,0019 (0,032)	-0,0020 (0,032)	0,0040 (0,034)	0,0060 (0,034)
Common language	-0,0094 (0,039)	-0,0097 (0,039)	-0,0132 (0,045)	-0,0085 (0,044)
Infant mortality Russia	-0,0689*** (0,003)	-0,0689*** (0,003)	-0,0706*** (0,004)	-0,0705*** (0,004)
Infant mortality Partner	0,0001 (0,000)	0,0001 (0,000)	-0,0003 (0,001)	-0,0001 (0,000)
ELF Partner	-0,0056 (0,032)	-0,0057 (0,032)	-0,0127 (0,038)	-0,0124 (0,038)
Constant	4,8451*** (0,204)	4,8515*** (0,168)	4,9113*** (0,247)	4,8219*** (0,186)
Obs.	1471	1471	1187	1187
R-squared	0,298	0,298	0,303	0,303
Institutions Partner	***IV (GDPpercap)***	***IV***	***IV (GDPpercap)***	***IV***
Log Distance	-0,0501 (0,056)	-0,3162*** (0,074)	-0,1292** (0,049)	-0,4855*** (0,076)
Log pr. real GDP	0,0281 (0,014)	0,2205*** (0,018)	-0,0227 (0,015)	0,1961*** (0,021)
Log pr. real per capita GDP	0,8857*** (0,046)		1,1409*** (0,037)	
Common border	0,2550** (0,086)	-0,0333 (0,150)	0,2008* (0,077)	-0,2209 (0,151)
Common language	-0,5006*** (0,142)	-1,2073*** (0,180)	-0,5907*** (0,154)	1,5729*** (0,212)
Infant mortality Russia	0,1039*** (0,011)	0,0707*** (0,013)	0,1043*** (0,010)	0,0674*** (0,015)
Infant mortality Partner	-0,0073** (0,003)	-0,0361*** (0,001)	0,0085*** (0,002)	-0,0376*** (0,002)
ELF Partner	0,1537 (0,119)	0,0376 (0,144)	0,2207 (0,119)	0,1667 (0,167)
Constant	-11,1874*** (1,023)	2,7358** (0,910)	-13,9081*** (0,857)	4,9294*** (0,963)
Obs.	1471	1471	1187	1187
R-squared	0,726	0,569	0,769	0,534

Standard errors in parentheses
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Appendix 3: IV method First-stage regressions with different institutional variables.

Institutional variable: Rule of law

Rule of law Russia	**Export**		**Import**	
	IV (GDPpercap)	***IV***	***IV (GDPpercap)***	***IV***
Log Distance	-0,003 (0,01)	-0,001 (0,01)	-0,008 (0,01)	-0,004 (0,01)
Log pr. real GDP	-0,001 (0,00)	-0,002 (0,00)	-0,001 (0,00)	-0,003 (0,00)
Log pr. real per capita GDP	-0,007 (0,00)		-0,013* (0,01)	
Common border	0,002 (0,02)	0,004 (0,02)	0,002 (0,02)	-0,001 (0,02)
Common language	-0,014 (0,02)	-0,008 (0,02)	-0,029 (0,03)	-0,012 (0,02)
Infant mortality Russia	-0,045*** (0,00)	-0,045*** (0,00)	-0,046*** (0,00)	-0,046*** (0,00)
Infant mortality Partner	-0,000 (0,00)	-0,000 (0,00)	-0,001 (0,00)	-0,000 (0,00)
ELF Partner	0,005 (0,02)	0,006 (0,02)	0,003 (0,03)	0,004 (0,03)
Constant	3,978*** (0,13)	3,868*** (0,10)	4,134*** (0,17)	3,915*** (0,13)
Obs.	1476	1476	1060	1082
R-squared	0,330	0,329	0,330	0,328
Rule of law Partner	***IV (GDPpercap)***	***IV***	***IV (GDPpercap)***	***IV***
Log Distance	-0,190** (0,06)	-0,472*** (0,08)	0,414*** (0,11)	0,236* (0,11)
Log pr. real GDP	-0,034 (0,02)	0,171*** (0,02)	0,165*** (0,04)	0,247*** (0,03)
Log pr. real per capita GDP	0,945*** (0,05)		0,544*** (0,07)	
Common border	0,234** (0,09)	-0,072 (0,16)	-0,112 (0,27)	-0,021 (0,26)
Common language	-0,850*** (0,14)	-1,603*** (0,18)	1,339*** (0,36)	0,655* (0,33)
Infant mortality Russia	0,113*** (0,01)	0,078*** (0,01)	0,090*** (0,02)	0,066** (0,02)
Infant mortality Partner	-0,008** (0,00)	-0,038*** (0,00)	0,010** (0,00)	-0,012*** (0,00)
ELF Partner	0,247 (0,13)	0,112 (0,16)	-0,298 (0,32)	-0,319 (0,30)
Constant	-9,729*** (1,10)	5,094*** (1,01)	-13,015*** (1,66)	-3,327* (1,43)
Obs.	1476	1476	1060	1082
R-squared	0,706	0,541	0,167	0,115

Standard errors in parentheses
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Institutional variable: Government effectiveness

Government effectiveness Russia	**Export**		**Import**	
	IV (GDPpercap)	***IV***	***IV (GDPpercap)***	***IV***
Log Distance	-0,003 (0,01)	-0,003 (0,01)	-0,000 (0,01)	-0,000 (0,01)
Log pr. real GDP	-0,002 (0,00)	-0,002 (0,00)	-0,002 (0,00)	-0,001 (0,00)
Log pr. real per capita GDP	0,001 (0,01)		0,001 (0,01)	
Common border	-0,001 (0,03)	-0,002 (0,03)	0,006 (0,03)	0,008 (0,03)
Common language	-0,005 (0,03)	-0,007 (0,03)	-0,007 (0,04)	-0,009 (0,04)
Infant mortality Russia	-0,074*** (0,00)	-0,074*** (0,00)	-0,073*** (0,00)	-0,073*** (0,00)
Infant mortality Partner	0,000 (0,00)	0,000 (0,00)	0,000 (0,00)	0,000 (0,00)
ELF Partner	-0,003 (0,03)	-0,004 (0,03)	0,009 (0,04)	0,009 (0,04)
Constant	5,115*** (0,18)	5,136*** (0,15)	5,074*** (0,24)	5,089*** (0,18)
Obs.	1471	1471	1044	1066
R-squared	0,389	0,389	0,391	0,391
Government effectiveness Partner	***IV (GDPpercap)***	***IV***	***IV (GDPpercap)***	***IV***
Log Distance	-0,014 (0,06)	-0,279*** (0,08)	0,417*** (0,11)	0,289* (0,12)
Log pr. real GDP	0,070*** (0,02)	0,262*** (0,02)	0,160*** (0,04)	0,248*** (0,03)
Log pr. real per capita GDP	0,883*** (0,05)		0,514*** (0,07)	
Common border	0,302** (0,10)	0,014 (0,16)	-0,438 (0,26)	-0,307 (0,24)
Common language	-0,483** (0,15)	-1,188*** (0,19)	1,250*** (0,35)	0,626* (0,31)
Infant mortality Russia	0,099*** (0,01)	0,066*** (0,01)	0,082*** (0,02)	0,058** (0,02)
Infant mortality Partner	-0,008** (0,00)	-0,036*** (0,00)	0,002 (0,00)	-0,017*** (0,00)
ELF Partner	0,210 (0,13)	0,094 (0,15)	-0,016 (0,34)	-0,133 (0,32)
Constant	-12,399*** (1,06)	1,482 (0,92)	-12,154*** (1,73)	-3,581* (1,45)
Obs.	1471	1471	1044	1066
R-squared	0,722	0,577	0,193	0,146

Standard errors in parentheses
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Institutional variable: Regulatory quality

Regulatory quality Russia	**Export**		**Import**	
	IV (GDPpercap)	***IV***	***IV (GDPpercap)***	***IV***
Log Distance	-0,001 (0,03)	-0,002 (0,03)	0,011 (0,04)	0,010 (0,03)
Log pr. real GDP	-0,005 (0,01)	-0,004 (0,01)	-0,006 (0,01)	-0,005 (0,01)
Log pr. real per capita GDP	0,003 (0,02)		0,003 (0,02)	
Common border	-0,002 (0,07)	-0,003 (0,07)	0,007 (0,08)	0,011 (0,08)
Common language	-0,006 (0,09)	-0,009 (0,09)	-0,003 (0,10)	-0,012 (0,09)
Infant mortality Russia	-0,090*** (0,01)	-0,090*** (0,01)	-0,087*** (0,01)	-0,088*** (0,01)
Infant mortality Partner	0,000 (0,00)	0,000 (0,00)	-0,000 (0,00)	-0,000 (0,00)
ELF Partner	-0,009 (0,07)	-0,010 (0,07)	0,026 (0,09)	0,025 (0,09)
Constant	5,484*** (0,46)	5,528*** (0,37)	5,375*** (0,62)	5,413*** (0,46)
Obs.	1478	1478	1062	1084
R-squared	0,127	0,127	0,123	0,124
Regulatory quality Partner	***IV (GDPpercap)***	***IV***	***IV (GDPpercap)***	***IV***
Log Distance	0,066 (0,06)	-0,176* (0,07)	0,388*** (0,11)	0,254* (0,11)
Log pr. real GDP	0,045** (0,01)	0,222*** (0,02)	0,126** (0,04)	0,209*** (0,03)
Log pr. real per capita GDP	0,824*** (0,05)		0,527*** (0,06)	
Common border	0,244* (0,10)	-0,018 (0,15)	-0,629* (0,24)	-0,486* (0,21)
Common language	-0,165 (0,17)	-0,818*** (0,20)	1,162*** (0,33)	0,491 (0,29)
Infant mortality Russia	0,096*** (0,01)	0,065*** (0,01)	0,095*** (0,02)	0,072*** (0,02)
Infant mortality Partner	-0,007* (0,00)	-0,033*** (0,00)	0,002 (0,00)	-0,018*** (0,00)
ELF Partner	-0,031 (0,13)	-0,160 (0,15)	-0,094 (0,31)	-0,220 (0,29)
Constant	-11,283*** (1,07)	1,649 (0,92)	-11,366*** (1,59)	-2,385 (1,31)
Obs.	1478	1478	1062	1084
R-squared	0,657	0,514	0,210	0,155

Standard errors in parentheses
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$